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TASMANIA.

REPORT

OF THE

SECRETARY FOR MINES

FOR

1902-1903

Including Reports of the Commissioners of Mines, Inspectors of Mines, Government Geologist, Assistant Government Geologist, Mount Cameron Water-Race Board, &c.

Tasmania:
JOHN VAIL, GOVERNMENT PRINTER, HOBART.
1903.

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REPORT OF THE SECRETARY FOR MINES.

Mines Department, Hobart,
27th August, 1903.

SIR,

I HAVE the honour to submit my Report upon the Mines Department, and the progress of the Mining Industry for the year ending the 30th June, 1903.

According to your instructions I have endeavoured to condense the Report on the Industry as much as possible, and have also omitted to publish with this Report the Geological Reports printed and issued during the year.

Although a saving in the cost of printing and publishing the Report will thus be made, the change will be seriously felt by the outside public, libraries, geological and other institutions, which have been in the habit of obtaining for their libraries the Annual Reports bound up in handy form, with the Geological Reports made during the year, as a permanent record of the work of the Department.

Extracts of the reports are made by Geological Societies and the Press in different parts of the world, particularly in Germany, France, and America; which, besides advertising the State's mineral resources and drawing attention to some of the rarer mineral deposits, have been the means of introducing capital for the development of the same.

In order to keep in touch as much as possible with these Societies it will be necessary to have an extra number of the Geological Reports printed as they are from time to time published. The reports are printed in pamphlet form, and are issued gratis. A large number is forwarded to the Agent-General in England for free distribution, and exchanges are made with the principal Mining and Geological Institutions of the world.

General Remarks.

Tasmania, like the other States, has not yet fully recovered from the mining depression which has existed for some time, and the value of the Minerals and Metals raised during the year shows a decrease of £206,983 as compared with last year.

Notwithstanding this decrease, which was probably owing to the prolongation of the South African war, which prevented the introduction of English capital for the development of some of our extensive tin deposits, the Mining Industry is steadily progressing, and a small rise in the market price of metals would give a great impetus to the Industry, and cause a considerable increase in the value of the output.

A large area of land in the Blue Tier district has recently been taken up on behalf of a Melbourne syndicate, with the object of obtaining foreign capital for the development of the immense tin deposits known to exist there.

Owing to the discovery of payable tin deposits in the vicinity of Heemskirk and Waratah, there has been a considerable revival in mining and prospecting for that mineral in those localities, and large areas of land have been applied for.

This State possesses very large deposits of tin which must be worked upon a very extensive scale to be made profitable, and this can only be secured by inducing outside capitalists to invest. It is intended, during the present session of Parliament, to introduce a Bill giving security of tenure to leaseholders upon certain conditions, and issuing leases entirely eliminating the labour covenants, upon payment, in advance, of an increased rent for the whole or any part of the lease; and it is hoped that by so doing capital will be obtained for the development of some of the now dormant mines.

The prospects for next year are very bright, and it is expected that the discoveries of tin at Mounts Agnew and Bischoff, together with the recent developments in the Mathinna District, will add considerably to the value of the output.

Appendices.

Appended will be found the following Reports and Papers :—

Anuual Report of the Mount Cameron Water-race Board.
Mine Managers' Examination Papers.
Report of the Government Geologist.
Report of the Assistant Gcvernment Geologist.
Report of the Chief Inspector of Mines.
Reports of the Inspectors of Mines.
Reports of the Commissioners of Mines.

Papers by :—
W. H. Twelvetrees, Esq., F.G.S., on the Trachydolerite in Tasmania.
Professor E. G. Hogg, M.A., on Certain Calcareous Nodules.
Colonel V. Legge, R.A., Contribution to the Physiography of Tasmania.
W. H. Twelvetrees, Esq., on a Geological Excursion to Port Cygnet.

James B. Lewis, Esq., on the Removal of the Overburden at the New Brothers' Home No. 1 Tin Mine.

J. J. Muir, Esq., M.I.C.E., on the Profitable Treatment of Silicious Low-grade Copper Ores.

Gold Mining.

Beaconsfield.—This district has given employment to between 500 and 600 men. The output of the field has sustained a temporary check, owing to the abnormal influx of water in the reef channel of the Tasmania Mine in driving the level at 1000 feet. The sinking pumps were unable to cope with it, and the unworked ground above the 818 feet level has consequently had to be exclusively relied upon for production. The Company proposes to provide more powerful pumping plant for developing the mine at the deeper levels. The new main shaft is down to 1100 feet from the surface, and at that level a crosscut towards the reef was being driven when the interruption occurred in August last. The reef at the 1000 feet closely resembles the stone worked in the upper parts of the mine, and winzes are being sunk from the 818 feet level on a good and payable reef. The Company has been approached by financiers in England, who are anxious to acquire an interest in this important mine, and the shareholders have recently authorised their Board to dispose of the mine to a new company with a capital of £500,000, which is practically a re-construction of the present company with the acquisition of £160,000 new working capital. Various engineers of repute have examined the mine, and there is a consensus of opinion that, when the water difficulty is overcome, the mine will resume its former prosperous career.

Since the formation of the Company 495,895 tons of quartz have been crushed, yielding 569,778 ounces of gold (inclusive of returns from chlorination), of the value of

£2,090,938. The dividends distributed have amounted to £772,071 15*s*.

The outside mines in this district have continued their exploratory work. The Moonlight-cum-Wonder Company is driving on the reef at the 500 feet level with indifferent results so far, the stone, though gold-bearing, being bunchy. Surface or shallow work is also proceeding on the Olive Branch sections of the Company's property, but the good shoots have been very short and irregular.

The Bonanza Proprietary is down 300 feet with its shaft, which is designed to cut the Tasmania reef on its underlay, and has intersected a lode channel carrying visible gold.

The Tasman Ophir Gold Mining Company has carried on work at its mine in the alluvial lead at Beaconsfield, and during the year cut auriferous wash at the 400 feet level. Preparations are being made for deeper work, and quite recently some gold-bearing wash has been found at a shallower level by a prospecting shaft; this can be cut from the level in the main shaft.

The Amalgamated West Tasmania has resumed work during the year. The mine formerly worked by the Tasmania United Company, on the west side of the Cabbage-tree Hill, has been taken up again, and there is some likelihood of the Tasmania West Extended Mine coming again into active work. The country on that side of the hill has been subjected to shallow trials only, and is regarded geologically as worthy of tests at greater depths.

At the Salisbury Tier the Salisbury Gold Mining Company has driven a crosscut level into the hill from its shaft, with a view of intersecting the old Victoria line of lode, at a depth of 150 feet below the former workings.

The Duchess of York Company, on the adjoining property, after obtaining some sensational slugs of gold from its adit workings, started a shaft for deeper exploration, but this has been suspended for the time, pending financial arrangements. The introduction of new capital into the Tasmania mine is expected to give a stimulus to mining throughout this field.

Lefroy.—The New Pinafore Company continued the search for payable quartz in its deeper levels without success, but has won some gold from the higher levels. The Company has now temporarily suspended work on its old leases, and taken up work on the neighbouring Point and Crown. The programme now being followed out is that of extending the existing levels in the Crown into virgin ground, and connecting them with the workings in the Point. The Crown shaft is down 390 feet, and driving is now going on at 190 feet. The shaft was sunk in a column of ore, each boundary of which has been disturbed by crosscourses. For the last few months the work has been payable, but the ground has now become irregular.

Mathinna.—At the New Golden Gate Mine the western reef has been intersected at a depth of 1500 feet from the surface. It has been driven upon for a considerable distance, showing stone of varying value, the reef being from 4 to 15 feet wide; valuable stoping ground is expected to be opened at this level. The 1200 and 1300 feet levels have also yielded payable stone. Crosscutting at 1600 feet from the surface is proceeding with a view of cutting No. 1 reef at that depth. This mine still has the deepest shaft in the State. Its prospects this year suffered temporarily from a good deal of the stone falling off in gold contents, but the outlook has begun to improve.

Up to the last cleaning up in May, the quantity of quartz crushed amounted to 218,206 tons, returning 191,357 ozs. of gold, valued at £730,598 14*s.* 2*d.* Up to the same date the dividends paid amounted to £326,400.

A British company, The Tasmanian Consols, has acquired the property north of and adjoining the Gate. It has cut, and is now driving on one of the Gate reefs at a depth of 1200 feet, with stone steadily improving in value.

The Volunteer Mine is duplicating its battery power. Its shaft is down to 250 feet. The stone is low grade but payable.

The Volunteer Consolidated has lately cut two highly payable lodes at a depth of 450 feet, and is now crosscutting for another.

The Yellow Boy is driving on a payable lode.

The New Golden King is down 200 feet, and has a payable reef; a 10-head battery is being erected.

The Waterfalls is a new mine in the district, and reports are favourable.

The introduction of British capital to work the old City of Hobart is promised at an early date.

The Mathinna goldfield is a wide belt of auriferous country traversed by large low-grade reefs, as well as smaller and richer veins. Thousands of acres have never had a pick in the ground, and with continued judicious prospecting, adequate capital, and good management the district ought to be the largest gold producer in Tasmania. An unusual amount of prospecting is being carried on, and there are more stampers at work and in course of erection than ever in the district. A good deal of the mineral belt is private property, and practically closed to mining.

Mangana.—The English Company has resumed work at the Mangana Reefs, and is unwatering the deep shaft with a view to crosscutting. The South Golden Entrance is driving on its lode with varied prospects.

Tullochgorum.—At Abbotsford Creek a 20-head battery is being erected, which it is expected will treat the low-grade stone profitably. A low adit level is being driven.

At Mount Victoria work on a small scale has been carried on continuously by small parties, and with payable results.

The Long Struggle and The Short Struggle parties at Alberton have raised small quantities of good stone. Some fresh reefs in the district have been uncovered, and work lately started upon them.

At the South Mount Victoria the Carnegie Syndicate, Hinemoa, and others have begun work. The whole field is still in need of adequate capital for its proper development. The numerous short makes of rich gold-bearing stone require to be worked on a fairly large scale to be remunerative, and suggest the desirability of proving the ground in depth, which has not been done yet.

The Ringarooma Company, which worked successfully at Alberton a few years ago, is still endeavouring to influence fresh capital.

Lyndhurst.—Attention has been directed to this field again through the recent discovery of an auriferous reef on the North Cross Mine, and some syndicates are already at work in the neighbourhood.

Lisle.—The Lisle Dredging Company has increased its pumping power, and during the time it has been at work has got through a fair amount of dirt of rather low grade. Deeper ground is now being approached, and better results are anticipated.

West Coast.—The Whyte River dredge has been working intermittently, with somewhat better results. It is intended to move the dredge down into the Pieman River.

Some mining has been going on at the Long Plains, where so much surface gold was found years ago. A little gold has been met with again, but the source is ill understood, and more prospecting is needed.

On the King River claim hydraulic sluicing has continued, and small quantities of gold have been recovered.

Operations have been started at the Old Harris' Reward mine, south of the King River; steam plant is being placed on the mine, and, after unwatering the shaft, sinking will be proceeded with.

The Princess River Gold Mine, which formerly yielded its owners £4000 worth of gold, is now to be re-started, provided certain arrangements can be made with the Mount Lyell Company for taking the pure silicious stone as a flux, and recovering the gold contents. Further work in this district has been carried on at Woody Hill, Harvey's Creek, Mount Ellen, &c.

Specimens of coarse gold have been reported from near the summit of Mount Darwin, and a little prospecting has gone on there.

The mount is in a copper-gold-silver iron belt, and discoveries are possible, though not much has resulted so far.

At Black Bluff the Lea River Gold Mining Company is opening up a mine in an auriferous formation, on which former owners did some shallow work.

Another venture in that neighbourhood has been started by the Devonport Prospecting Association. If these enterprises are successful a new field will be opened up about 30 miles distant from Mole Creek, or a little more from Ulverstone.

Silver Mining.

This branch has had to contend with adverse markets during a great portion of the year, though prices have improved recently. Notwithstanding this, the established mines have maintained the value of their output. Our silver mines are situate in the western part of the Island, the chief productive ones being the British Zeehan, Zeehan Montana, Oonah, Zeehan Queen, &c., at Zeehan; the Hercules, Comet, Ring Valley, at Dundas; the North Mount

Farrell, at Mount Farrell; the Magnet, at Waratah. Besides these, there are numerous smaller mines and claims at work in these districts, swelling the aggregate output.

Tasmanian Smelting Company, Limited.—During the year the Company purchased 24,265 tons of ore, containing 6925 tons of lead, 1,147,551 ozs. of silver, and 2815 ozs. of gold, and exported in bullion 6619 tons of lead, 1,131,226 ozs. of silver, and 2474 ozs. of gold.

During the same period the Company smelted 23,981 tons of crude silver-lead ore, and purchased 6595 tons of gossan flux, in addition to which they quarried from the Balstrup section and sold to the North Mount Lyell Copper Company 4770 tons of ironstone.

The British Zeehan and Zeehan Montana (the latter the deepest mine in Zeehan), have continued putting out large quantities of high grade ore.

The Oonah output has been principally stannite; the old south workings, from which large quantities of good silver-lead ore were won, are about to be opened up again.

The Zeehan South Comstock Mine has been working its zinc-lead deposit somewhat desultorily, and is reported to have lately acquired the adjoining property of the Comstock. It is understood that active work will be resumed.

At Dundas, the Comet mine was unfortunately visited by a fire, and subsequently by a flood in February last, when all the workings below No. 1 level were completely flooded. The work of unwatering had to be set about, and production has consequently been retarded.

At Mount Read the Hercules mine has sent away large quantities of sulphide and gossan ores for smelting, the realisation of which has proved profitable. A fair rate of profit is returned from the gossan ore. Metallurgical economies having been effected at the Tasmanian Smelting works. It has been found possible to supply certain low grade ores which might otherwise not have been mined.

The Hercules Company is driving a low adit to prove its copper ore deposit at greater depth. The mine has now reached the dividend-paying stage, the first dividend having been declared.

The North Mount Farrell Mine tramway has been completed, and the Company has erected concentrating works for dressing their milling ore. Regular consignments of ore are being made to the Smelters at Zeehan.

The Mackintosh Company has resumed work on its section at Mount Farrell, and has been sending out ore.

The Mount Farrell Company has continued its drive toward the line of the North Farrell lode. Additional ground has been taken up at Mount Farrell, and there is every reason to anticipate that the field will become a busy centre.

The Magnet mine has produced and shipped upwards of 1000 tons of ore per month during the last year. The exceptionally low market prices for silver and lead have prevented the Company's operations from being as profitable as could have been wished, but the rising rates lately have had an immediate beneficial effect on the profits.

During the year a winze from the lowest level has proved the ore downwards, and the Company is arranging to exploit this ore to a depth of 100 feet below the level. The ore chute has been shown in the upper part of the mine to extend southwards, assuring the prospects to what is considered a very satisfactory extent.

The Confidence and Long Tunnel mines, in the Heazlewood district, have been contributing to the output of ore; both of these merit the introduction of capital. With improved prices for lead and silver, many lodes in that

The Arbá Mine, at Branxholm, has produced fairly well this year. The plant has been re-constructed, and its prospects are considered excellent.

The Pioneer Tin Mine, at Bradshaw's Creek, has pumped and sluiced 665,000 cubic yards of drift, averaging 2·330 lbs. of stream tin per cubic yard, at a cost of 6·295*d.* for a yield of 692 tons of stream tin, at a cost of £25·215 per ton. The amount paid in dividends was £16,875. The total amount paid in dividends by the Company is £21,875.

All through this field smaller mining companies and prospectors have had a good year. In the Ringarooma division, the Star of Peace has started to produce tin ore. Activity has also prevailed in the Weldborough district. The Scotia Mine is the largest producer at Gladstone, and has been maintained by the courage and perseverance of its owner. Outside the Scotia, the claims at Gladstone have shown no improvement. The old claims may still continue to yield small quantities of ore for a considerable period, but the best ground is too high to receive water from the present Government race. The condition of the race gives cause for anxiety, and the best means of conserving the interests of the district will have to be taken into serious consideration.

The Lottah mines comprise the Anchor, Australian, Ogilvie's Lease, and a couple of dozen other claims on the Blue Tier.

The Tier has produced nearly 300 tons of tin ore during the year.

The Anchor Mine has had a fair water supply from its new race, and during the year crushed 107,882 tons of stone, from which 249½ tons of tin ore were obtained, net value £19,686.

The Australian is readjusting its haulage line, and will then be in a position to improve its production with decreased cost.

The profitable exploitation of the huge body of low-grade tin ore enclosed in this Tier is dependent on the proper handling of the questions of power, economical mining, and extraction on a sufficiently comprehensive scale. Isolated attempts on a small scale to cope with the problem would appear to be useless in view of the extreme lowness of the grade.

In the St. Helens district the principal mine is the Royal Ruby. Besides this several other alluvial claims have contributed to the output of the field (about 50 tons tin ore.)

Mount Rex Mine.—A satisfactory market has been found for the product of this mine, and regular shipments have been made; the weekly output is about four tons. There has been considerable outlay on necessary development work, and as soon as the latter is finished—in a month—it is stated that a better quality of stone can be raised. The shaft is down 250 feet, and is being sunk another 100 feet.

South Esk Mine.—A large ore-body is reported to be in sight at this mine, and the work has been mainly directed towards opening it up. The alluvial workings at the mine, though limited, have given good results.

North-West.—The Badger Tin Field, 5 to 7 miles from Waratah, is being opened up by several parties. What appears to be a good formation has been exposed in the granite rock, and prospectors are out in the neighbourhood searching and taking up claims.

West Coast.—Mayne's Mine is being actively worked, and other discoveries in the district have added to the interest being taken now in Mount Heemskirk.

The Federation Tin Mine has not yet been refloated, but when the necessary capital is obtained the effect will be felt by the field in general. The prospects of the field are good, and with judicious management for the discoveries being made, Mount Heemskirk ought to occupy the prominent position which was anticipated for it years ago.

The North-East Dundas district, with the Renison Bell and other properties, has not yet come forward to the extent which would be justified by the indications noticeable at many points within its area. The inevitable process of exhaustion of our alluvial deposits, which is naturally in progress, makes it incumbent to promote in every way the development of lode tin-mining.

Coal Mining.

The Cornwall and Mount Nicholas collieries are the largest producers in the State. The other producing coal mines have been Spreyton and Dulverton collieries in the Mersey basin; Jubilee and Cardiff, at St. Mary's; Mount Cygnet, on the Huon; York Plains and Glen Leith, on the Main Line Railway; and quite lately the Sandfly has begun to raise coal.

The Cornwall resumed shipments to Victoria after the strike at the mine was over, but prices were not quite up to expectation. Indications are favourable for a good market this season.

At the Cardiff the seam, at the beginning of the twelve months, was dislocated by a fault, and deliveries have been interrupted, but fresh capital is being raised, and work is to be recommenced.

A new colliery has been started at Colebrook, called the Marialva.

The Preolenna coal property, south of Wynyard, has been prospected by the lessees to some extent during the year; besides sundry other seams, a seam of oil shale and bituminous coal has been disclosed. Unfortunately it is only 20 inches thick, and 16 miles from the sea by road, but the quality of the shale is such as will make the discovery

very important when, in the future, the railway is brought into the Flowerdale district.

Some private exploration has been going on on the banks of the River Tamar, and an attempt has been made to revive an old discovery of coal near George Town.

Iron Mining.

Nothing has been done this year beyond raising and shipping limited quantities of iron ore from the Penguin mines for fluxing purposes. The large deposit at the Blythe River is still unworked, pending legislation in the Federal Parliament on assistance to be given to the iron-making industry in Australasia. A Federal Iron Bonus Committee has been sitting, and evidence as to the iron ore resources of Tasmania was submitted to it by the Government Geologist, who attended by request.

MINERAL PRODUCTS.

The following return shows the quantity and value of metals and minerals produced during the year ending 30th June, 1903:—

	Quantity.		Value.
Gold won (fine)............	*64,241	ounces	£272,880
Silver ore raised	45,450	tons	211,743
Tin ore raised...............	3463	tons	273,585
Copper ore	1927	tons	22,289
Copper (blister)............	6213	tons	418,570†
Copper matte	6227	tons	133,736
Coal	51,443	tons	43,726
Iron ore......................	3174	tons	1480
Flux ore	7076	tons	5395
Zinc ore......................	204	tons	487
TOTAL..............................			£1,383,891

* Including 22,278 ounces obtained from blister copper.

† The value of the gold contained in the blister copper has been deducted from this amount.

A decrease of £206,983 on the previous year.

The total amount paid in dividends and bonuses was £150,851.

Geological Branch.

In the Geological and Mining Branch of the Service work has proceeded steadily. The services of both geologists have been in continuous request, and some useful examinations of mining fields have been made during the year. The Zeehan, Heemskirk, Comstock, and part of the Dundas districts have been examined by the Assistant Geologist; who is preparing a geological sketch map of the district to accompany a report on the Zeehan Field.

It is hoped that these will be of substantial service to all in that part of the West Coast.

The Chief Geologist has inspected the Beaconsfield, Den, Preolenna, Heazlewood, Long Plains, and Penguin districts. Reports of some of these have been issued, others are being prepared.

Further impending examinations are those of West Dundas, Mount Farrell, Mount Lyell, Dial Range, Mathinna, Lyndhurst, &c.

The Launceston office continues to be a place of call, where visitors interested in mining receive information respecting the mines and minerals of the State. An increasing number of inquiries for our mining publications and other information is received from abroad (Europe and America), and this dissemination of information will no doubt bear fruit in directing attention to our mines.

Inspection of Mines.

The inspection of mines has proceeded as usual, the protection afforded by these inspections to the miner (against his own carelessness, as well as against neglect on the part of the mine owner) is being shown constantly. The two Inspectors on the West Coast have upwards of 90 mines and working claims under their charge, besides the examination of some of the accidents in smelting works (non-machinery accidents). The Inspector for the northern and eastern part of the Island also visits about 90 mines and claims. These Inspectors are also charged with the inspection of roads and tracks on behalf of the Public Works Department.

The examination of the plans of underground workings takes place in tho Launceston office, and, thanks to the better attention which it has been possible to bestow on these plans in the office during the last year or two, the quality of the surveys has distinctly improved.

Mining Managers' Examination.

The annual examination of candidates for Mining Managers' Certificates was held in March last. Four candidates presented themselves for examination, but only two succeeded in obtaining certificates.

At the last meeting of the Mining Managers' Examination Board, in April, four First-class Mining Managers' Certificates were granted, under Regulation 112, to persons holding equivalent certificates granted by similar examining bodies in other States, and one Service Certificate was granted under Regulation 116.

The Board is considering a scheme for the granting of certificates to candidates qualifying themselves for taking charge of stamp batteries and other ore concentrating mills. The examinations conducted by the Board have been referred to on the mainland in terms of commendation. Candidates who have successfully passed through the course at the Zeehan School of Mines are excused from further examination.

Diamond Drills.

The Government diamond drills have been at work on sundry coal fields under arrangements with several coal mining syndicates or companies.

At Recherche Bay two bores were put down in the coal measure sandstones south of the Catamaran River. Only coal markings were met with, and the drill finally entered igneous rock, in the one case at a depth of 216½ feet, in the other at 695 feet from the surface. It was then removed to Moss Glen Company's mine, further north, where shallow work had shown the seam to be faulty. The first exploratory bore was sunk on the shore of the bay, in the sandstone, but only passed through small coal veins, and struck the underlying eruptive rock at a depth of 515 feet. The second bore was sunk higher up the mountain, but operations were suspended after the drill had passed through an eight-foot seam of soft coal and bands, at a depth of 57 feet.

On the West Coast the No. 2 diamond drill was employed putting down bores—first at Eden, and afterwards on the Farm Cove Company's claim on the shores of Macquarie Harbour. Boring was discontinued at Eden (at 110 feet) as soon as it was seen that the indications were not favourable. The Farm Cove bore was carried down to a depth of 571 feet, in the lignite series of clays and sands of Tertiary age, and was suspended before entering the coal measure sandstones which are supposed to underlie these.

Mount Cameron Water Race.

The Report of the Board is appended.

Departmental Staff.

The following changes have been made during the year:—

J. R. Quinn, Junior Clerk, transferred to the Lands Department.

M. Vincent, Junior, Messenger, transferred to the Lands Department.

A L. Fitzherbert, Junior Clerk, Launceston, transferred to the Lands Department.

G. C. Gilmore, Commissioner of Mines, Zeehan, retired.

J. P. Piggott, Junior Clerk, transferred from Public Works Department.

F. C. Wills, Registrar of Mines, Burnie, office abolished.

L. E. Chambers, Commissioner of Mines, Queenstown, removed to Zeehan.

Revenue.

The net revenue for the year amounted to £17,776 14*s*. 3*d*., being a decrease of £1694 5*s*. 10*d*. on the previous year.

The above amount does not include a sum of £2772 15*s*. 1*d*. deposited as survey fees with applications for leases.

Conclusion.

In conclusion, I desire to place upon record my sincere thanks to W. H. Twelvetrees, Esq., Professor E. G. Hogg, Colonel Legge, J. J. Muir, Esq., J. B. Lewis, Esq., for the papers contributed by them, also to the Officers of the Department for the efficient manner in which they have performed their duties during the year.

I have the honour to be,
Sir,
Your very obedient servant,

W. H. WALLACE,
Secretary for Mines.

The Honourable the Minister of Mines.

DIAMOND DRILLS.

Statement of Work done to 30th June, 1903.

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance Bored.	Average cost per foot, inclusive of Labour and Fuel.		
	No. 1 Drill.			feet.	£	s.	d.
1882-3	Back Creek—For Gold	Vertical	7	1330	0	10	9
1883	Lefroy—For Gold	Ditto	4	1011	0	5	3
1884	Tarleton—For Coal	Ditto	1	401	0	5	6
1886	Longford—For Coal	Ditto	2	1585	0	4	0½
1886-7	Harefield Estate—For Coal	Ditto	1	725	0	6	5
1887	Cardiff Claim, Mount Malcolm—For Coal	Ditto	1	562	0	17	11¾
1888	Killymoon Estate—For Coal	Ditto	1	504	0	4	7¾
1888-9	Seymour—For Coal	Ditto	5	2266	0	7	8½
1889 1890	Beaconsfield (Phœnix G.M. Co.)—For Gold	Ditto	1	781	2	0	2
1890	Beaconsfield (East Tasmania G.M. Co.)—For Gold	Ditto	1	978	0	14	9½
1891	Spring Bay—For Coal	Ditto	4	937	0	6	10
1891	Ravensdale—For Coal	Ditto	1	114	0	11	1½
1891-2	Back River, Prosser's Plains—For Coal	Ditto	2	854	0	6	1¾
1892-3	Lefroy (Deep Lead Syndicate)—For Gold	Ditto	4	979	0	15	9
1893	Lefroy (East Pinafore Co.)—For Gold	Ditto	1	317	0	10	3
1895-6	Sandfly—For Coal	Ditto	4	2130	0	11	5
1898 1900	Blue Tier (Anchor Co.)—For Tin	Ditto	9	876½	0	9	1¾
1901-2	Llandaff—For Coal	Ditto	3	1944	0	7	4
1902	Recherche (Catamaran Co.)—For Coal	Ditto	2	956	0	9	3
1903	Ditto (Moss Glen Co.)—For Coal	Ditto	2	667	0	7	6
	TOTAL	...	54	19,917½			

	No. 2 Drill.				
1882	Beaconsfield—For Gold	Horizontal, underground	1	68	No record.
1883	Mangana—For Gold	Ditto	1	546	0 15 1
1884	Guy Fawkes Gully, near Hobart—For Coal	Vertical	1	612	0 5 6
1885	Malahide Estate, near Fingal—For Gold	Ditto	5	1897	0 5 6
1886	Carr Villa, near Launceston For Coal	Ditto	1	571	0 5 4
1886-7	Waratah (Mount Bischoff Alluvial T.M. Co.)—For Tin	Ditto	7	1548	0 6 1½
1887	Waratah (Mount Bischoff T.M. Co.)—For Tin	Ditto	7	841	0 11 8
1887	Ditto	Horizontal, underground	1	53	0 7 8
1888	Old Beach—For Coal	Vertical	1	593	Abt. 0 10 9
1888	Campania—For Coal	Ditto	1	600	0 7 7½
1888	Richmond—For Coal	Ditto	1	500	0 5 1¾
1889	Back Creek—For Gold	Ditto	4	787	0 8 5½
1891	Macquarie Plains—For Coal	Ditto	2	989	0 4 5½
1891	Jerusalem—For Coal	Ditto	1	344	0 4 9½
1892	Langloh Park - For Coal	Ditto	4	1249	0 5 3¼
1893	Southport—For Coal	Ditto	1	612	0 5 3
1894	Zeehan (Tasmania Crown S.M. Co.)—For Silver	Horizontal, underground	2	819	1 0 2½
1902	Eden—For Coal	Vertical	2	566	1 0 7½
1902-3	Farm Cove—For Coal	Ditto	1	571	0 5 6
	Total	...	44	12,766	

Aggregate number of bores	98
Total Distance bored	32,683½ feet.

W. H. WALLACE, *Secretary for Mines.*

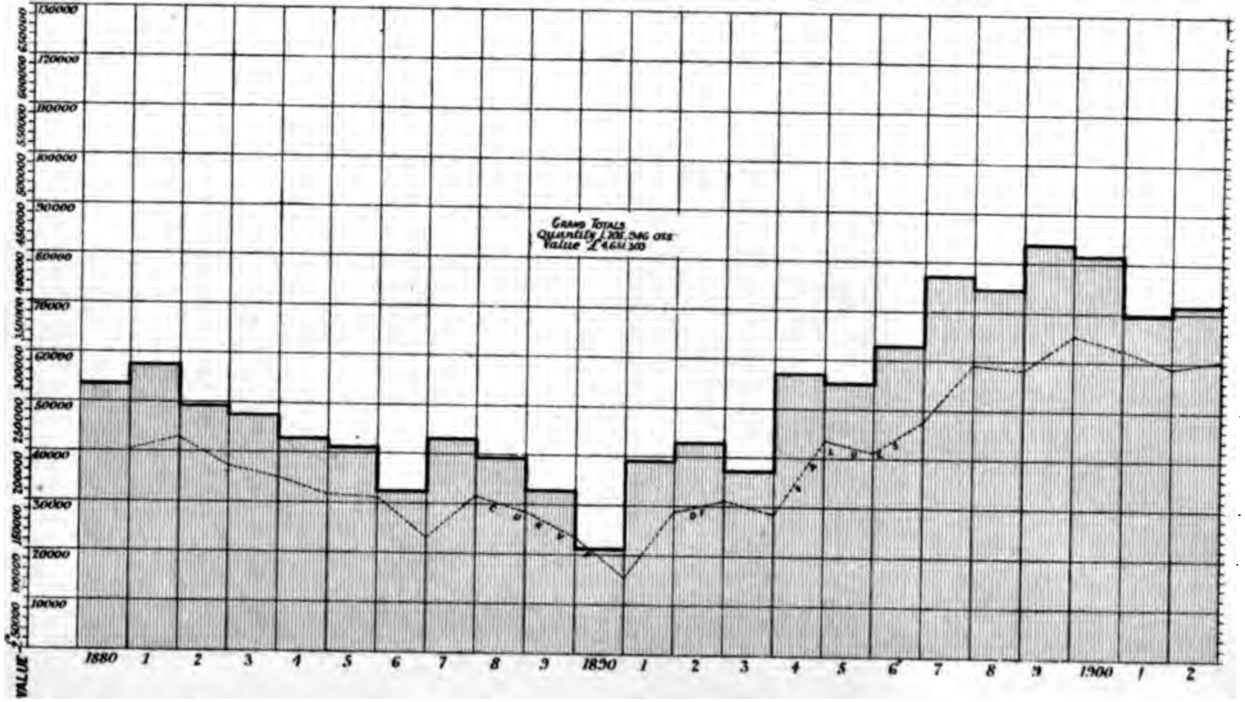
No. 1.

RETURN showing the Quantity and Value of Gold won during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and the first Half-year of* 1903.

Year.	Quantity.		Value.
	ozs.	dwts.	£
1880	52,595	0	201,297
1881	56,693	0	216,901
1882	49,122	6	187,337
1883	46,577	10	176,442
1884	42,339	19	160,404
1885	41,240	19	155,309
1886	31,014	10	117,250
1887	42,609	3	158,533
1888	39,610	19	147,154
1889	32,332	13	119,703
1890	20,510	0	75,888
1891	38.789	0	145,459
1892	42,378	0	158,917
1893	37,687	0	141,326
1894	57,873	0	217,024
1895	54,964	0	206,115
1896	62,591	0	237,574
1897	77,131	0	296,660
1898	74,233	0	291,496
1899	83,992	0	327,545
1900	81,175	0	316,220
1901	*69,491	0	295,176
1902	*70,996	0	301,573
1903, for first Half-year	*28,093	0	119,331
	1,234,038	19	4,770,634

* Fine Gold.

Diagram showing Total Quantity & Value of Gold won in Tasmania during the years 1880-1902



No. 2.

RETURN showing the Quantity and Value of Gold obtained from Quartz during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and the first Half-year of* 1903.

Year.	Quantity.	Value.
	ounces.	£
1880	34,345	130,622
1881	45,776	174,956
1882	36,215	137,183
1883	36,672	138,060
1884	30,540	114.630
1885	33,266	124.234
1886	25,004	87,516
1887	33,427	123,458
1888	34,156	126,139
1889	33,069	116,517
1890	17,829	64,184
1891	33,659	126,221
1892	34,386	128,947
1893	30,163	113,111
1894	52,239	195,896
1895	51,628	193,605
1896	59,453	222,948
1897	74,937	288,432
1898	72,080	283,422
1899	81,751	319,141
1900	79,977	311,580
1901	*68,779	292,155
1902	*70,440	299,212
1903, for First Half-year	*27,685	117,598
	1,097,476	4,229,762

* Fine Gold.

No. 3.

***RETURN showing the Quantity and Value of Coal raised during the Years* 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and the first Half-year of* 1903.**

Year.	Quantity.	Value.
	tons.	£
1880	12,219	10,998
1881	11,163	10,047
1882	8803	7923
1883	8872	7985
1884	7194	6475
1885	6654	5989
1886	10,391	9352
1887	27,633	24,870
1888	41,577	37,420
1889	36,700	33,030
1890	50,519	45,467
1891	43,256	38,930
1892	36,008	32,407
1893	34,693	27,754
1894	30,499	24,399
1895	32,698	26,159
1896	41,904	33,523
1897	42,196	33,757
1898	47,678	38,256
1899	42,609	38,349
1900	50,633	44,227
1901	45,438	38,451
1902	48,863½	41,533
1903, for first Half-year	25,108	21,342
	743,300½	638,643

Diagram showing Total Quantity & Value of Coal raised in Tasmania during the years 1880-1902

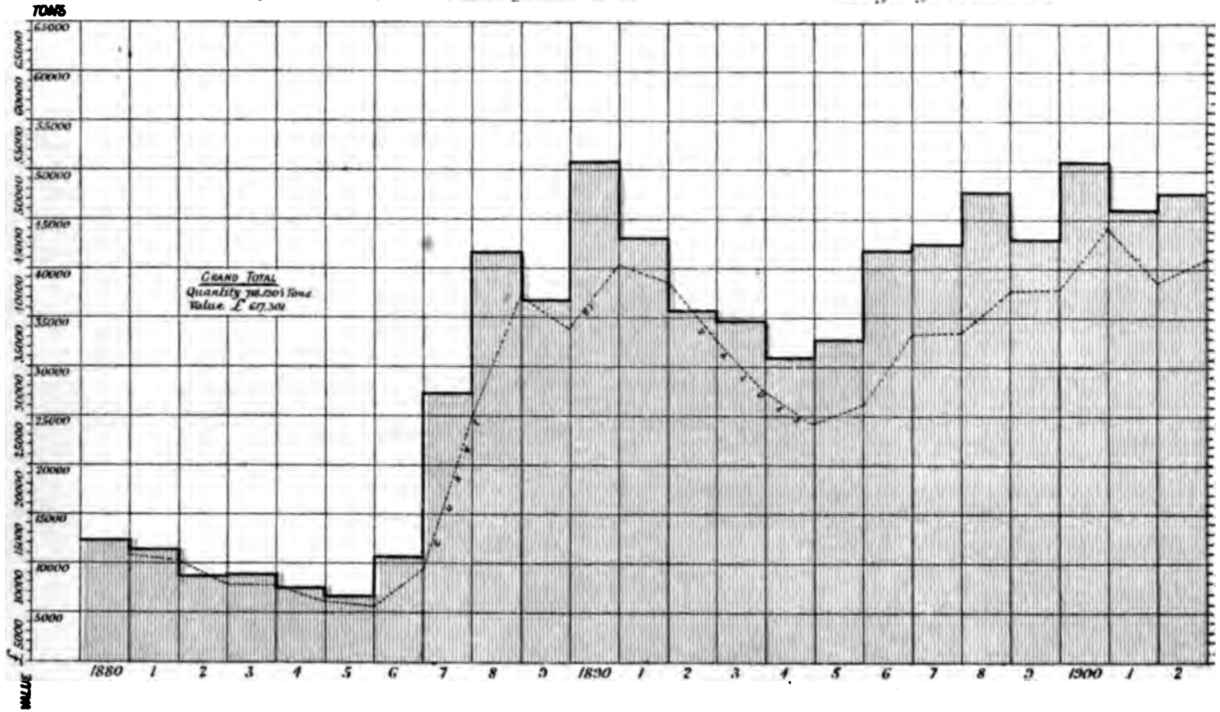
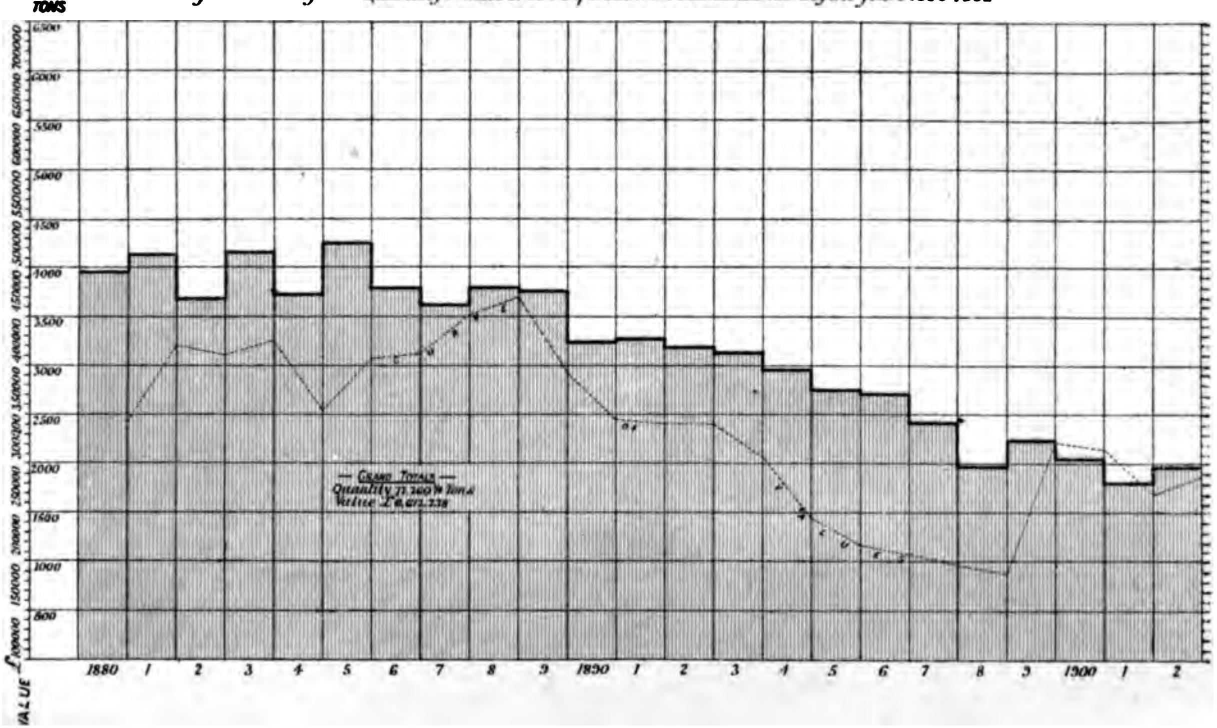


Diagram showing Total Quantity & Value of Tin exported from Tasmania during the years 1880-1902



No. 4.

RETURN** showing the Quantity and Value of Tin exported from Tasmania during the Years* **1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1896, 1898, 1899, 1900, 1901, 1902,** ***and for the first Half-year of **1903,** ***compiled from Customs Returns only.***

Year.	Quantity.	Value.
	Tons.	£
1880	3954	341,736
1881	4124	375,775
1882	3670	361.046
1883	4122	376,446
1884	3707	301,423
1885	4242	357,587
1886	3776	363,364
1887	3607½	409,853
1888	3775¼	426,321
1889	3764	344,941
1890	3209¼	296,368
1891	3235	291,715
1892	3174	290,083
1893	3128½	260,219
1894	2934	198,298
1895	2726¾	167,461
1896	2700	159,036
1897	2423½	149,994
1898	1972	142,046
1899	2239¼	278,323
1900	2029	269,833
1901	1789½	212,542
1902	1958¼	237,828
1903, for first Half-year	1113⅖	145,827
	73,374 3/20	6,758,065

No. 5.

***RETURN** showing the Quantity and Value of Silver Ore produced during the Years* 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and the first Half-year of* 1903.

Year.	**Quantity.**	**Value.**
	tons.	£
1888	417	5838
1889	415	7044
1890	2053	26,487
1891	4810	52,284
1892	9326	45,502
1893	14,302	198,610
1894	21,064	293,043
1895	17,980	175,957
1896	21,167	229,660
1897	18,364	200,167
1898	15,320	188,892
1899	31,519½	250,331
1900	26,564	279,372
1901	28,774	207,228
1902	46,480	218,864
1903, for first Half-year	18,935	94,694
	277,490½	2,473,973

No. 6.

RETURN showing the Quantity and Value of Blister Copper produced during the Years 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and the first Half-year of* 1903.

Year.	Quantity.	Value.
	tons.	£
1896	41½	1245
1897	4700	322,500
1898	4955½	400,668
1899	8598	735,305
1900	9449	907,288
1901	9981	879,625
1902	7745	*462,151
1903, for first Half-year	2934	*262,621
	48,404	3,971,403

* Value of Gold contained deducted.

No. 7.

RETURN showing Quantity and Value of Copper Matte exported during the Year 1902, *and the first Half-year of* 1903.

Year.	Quantity.	Value.
	Tons.	£
1902	2500	50,112
1903, for first Half-year	3727	83,624
	6227	133,736

No. 8.

***RETURN** showing the Quantity and Value of Copper Ore produced during the Years* **1896, 1897, 1898, 1899, 1900, 1901, 1902,** *and the first Half-year of* **1903.**

Year.	Quantity.	Value.
	Tons.	£
1896	34	1020
1897	75	2250
1898	394	8128
1899	1695	26,833
1900	4221½	63,589
1901	11,221	130,412
1902	5994	65,270
1903, for first Half-year	102	790
	23,736½	298,292

No. 9.

***RETURN** showing the Quantity and Value of Iron Ore produced during the Years* **1897, 1898, 1899, 1900, 1901, 1902,** *and the first Half-year of* **1903.**

Year.	Quantity.	Value.
	Tons.	£
1897	894	812
1898	1598	1598
1899	3577	3474
1900	5375	5995
1901	612	417
1902	2386	1075
1903, for first Half-year	2430	1130
	16,872	14,501

No. 10.

***RETURN** showing the Quantity and Value of Asbestos produced during the Years* **1899, 1900, 1901, 1902,** *and the first Half-year of* **1903.**

Year.	Quantity.	Value.
	Tons	£
1899	200	363
1900	128	113
1901	46½	45
1902	—	—
1903, for first Half-year	—	—
	374½	521

No. 11.

***RETURN** showing the Quantity and Value of Wolfram produced during the Years* **1899, 1900, 1901, 1902,** *and the first Half-year of* **1903.**

Year.	Quantity.	Value.
	Tons.	£
1899	3½	99
1900	53¾	2058
1901	—	—
1902	—	—
1903, for first Half-year	—	—
	57¼	2157

No. 12

RETURN showing the Quantity of Silver Lead and Copper Ore smelted for period 25th June to 31st December, 1896, *and* 1*st January* 1897, *to* 31*st December,* 1902.

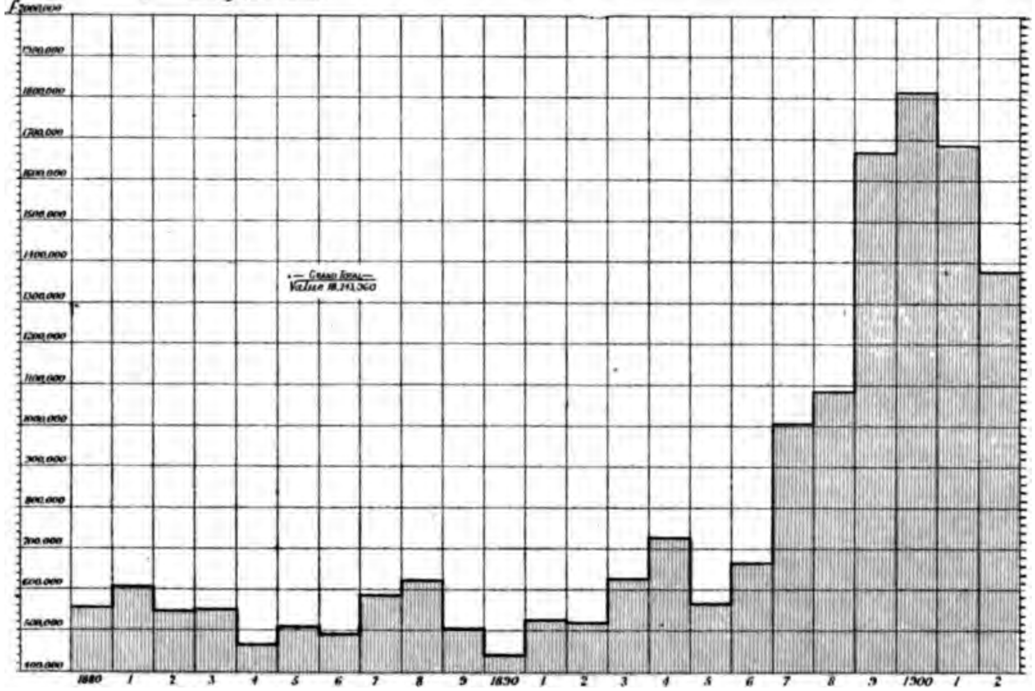
Year.	Ore Smelted.	Products.			Yield.			
		Silver Lead Bull'n.	Blister Copper.	Matte.	Copper.	Silver.	Gold.	Lead.
	Tons.	Tons.	Tons.	Tons.	Tons.	Ozs.	Ozs.	Tons.
1896	26,028$\frac{13}{20}$	—	—	2417$\frac{6}{20}$	1235$\frac{1}{20}$	75,951	4707	—
1897	90,773$\frac{1}{2}$	—	3476$\frac{12}{20}$	257$\frac{16}{20}$	3583$\frac{14}{20}$	334,349	16,485	—
1898	170,933	—	4992	—	4783	606,123	24,418	—
1899	275,239	2295	8463	89$\frac{8}{20}$	8362	1,089,657	27,615	—
1900	363,113	4817	9449	—	9341	1,215,036	26,255	—
1901	355,528	1839	9982	50	9880	800,317	21,717	—
1902	384,150	6825	7727	—	7639	1,625,179	24,420	6654

No. 13.

RETURN showing the Average Number of Persons engaged in Mining during the Years 1880 *to* 1902 *inclusive, and first Half-year of* 1903.

Year.	Number.	Year.	Number.
1880	1653	1892	3295
1881	3156	1893	3403
1882	4098	1894	3433
1883	3818	1895	4062
1884	2972	1896	4350
1885	2783	1897	4510
1886	2681	1898	6052
1887	3361	1899	6622
1888	2989	1900	7023
1889	3141	1901	6923
1890	2868	1902	5934
1891	3219	1903, first Half-year	6430

Diagram showing the Annual Value of Minerals & Metals raised in Tasmania from 1880-1902



No. 14.

RETURN showing the Number and Area of Leases held under "The Mining Act 1900," in force on 30th June of each year since 1897.

Nature of Lease.	In force on 30th June, 1897.		In force on 30th June, 1898.		In force on 30th June, 1899.		In force on 30th June, 1900.		In force on 30th June, 1901.		In force on 30th June, 1902.		In force on 30th June, 1903.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.
For Minerals, Silver, Tin, &c.	1150	56,493	1290	66,981	1207	64,339	1487	70,500	1388	60,865	1063	45,399	950	40,068
For Coal, Slate, Shale, &c.	38	6105	41	5943	39	6002	52	7258	55	7566	52	7819	66	10,767
For Gold	615	5789	702	7190	652	6725	647	6623	566	6091	425	4166	310	3117
Water Rights, Mineral and Gold	155	774 sluice-heads.	159	784 sluice-heads.	200	933 sluice-heads.	225	1004 sluice-heads.	267	1318 sluice-heads.	300	1691 sluice-heads.	299	1514 sluice-heads.

No. 15.

RETURN showing the Number and Area of Leases under "The Mining Act, 1900," *in force on the* 1*st July*, 1902, *issued during the Year ending* 30*th June*, 1903, *cancelled during the Year ending* 30*th June*, 1903, *and remaining in force on* 30*th June*, 1903.

Nature of Lease.	In force on 1st July, 1902.		Issued during Year ending 30th June, 1903.		Cancelled during Year ending 30th June, 1903.		In force on 30th June, 1903.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.
		Acres.		Acres.		Acres.		Acres.
For Minerals, Silver, Tin, &c.......	1063	45,399	233	9857	346	15,188	950	40,068
For Coal, Shale, Slate, &c.	52	7819	26	5198	12	2250	66	10,767
For Gold................................	425	4166	101	967	216	2016	310	3117
Water Rights, Mineral and Gold..	300	1691 sluice-heads	57	193 sluice-heads	58	370 sluice-heads	299	1514 sluice-heads

No. 16.

COMPARATIVE Statement of Net Revenue from Mines, being Rents, Fees, &c., paid to the Treasury for the Years ending 30th June, from 1880 to 1903.

Year.	Amount. £	s.	d.	Year.	Amount. £	s.	d.
1880	8944	5	11	1892	17,568	18	4
1881	20,936	5	5	1893	16,971	9	2
1882	23,077	1	9	1894	16,732	7	7
1883	15,439	14	5	1895	15,323	1	9
1884	6981	11	10	1896	20,901	13	2
1885	11,070	5	7	1897	25,631	0	3
1886	12,523	10	4	1898	33,661	13	9
1887	14,611	11	5	1899	24,696	10	5
1888	23,502	8	4	1900	28,380	11	10
1189	17,254	9	0	1901	21,569	5	2
1890	26,955	4	9	1902	19,471	0	1
1891	37,829	16	5	1903	17,776	14	3

The above Statement does not include Stamp Duties upon Transfer of Leases and Registration of Companies, or the Tax payable upon Dividends, from which sources large sums are derived.

No. 17.

RETURN showing the Total Number and Area of Leases in force on 30th June, 1903.

Minerals.	Number.	Area.
		Acres.
Gold	310	3117
Minerals	187	10,999
Silver	186	9666
Copper	68	4103
Tin	485	14,044
Coal	38	7101
Limestone	11	662
Iron	16	756
Slate	1	200
Wolfram	3	160
Asbestos	2	140
Precious Stones	1	80
Lithographic Stone	1	97
Marble	1	317
Shale	14	2380
Bismuth	1	40
Monazite	1	80
Machinery Sites	19	78
Dredging Claims	30	447
Mining Easements (under "The Mining Act, 1900")	24	197
Dam Sites	57	796
Water Rights	299	1514 sluice-heads.

No. 18.

RETURN showing the Average Number of Miners employed during the Year ending 30th June, 1903.

	Europeans.	Chinese.
Northern and Southern Division	675	...
North-Eastern Division	504	150
Eastern Division	777	64
North-Western Division	418	...
Western Division	3896	...
	6270	214

No. 19.

RETURN showing the Mining Companies registered during the Year ending 30th June, 1903.

Number of Companies.	Capital.
16	£37,225.

In addition to the above, 10 Agents for Foreign Companies, and 11 Syndicates, under 60 Vict. No. 51, were registered.

No. 20.

RETURN showing the Total Area of Land applied for during the Year ending 30th June, 1903.

Mineral.	No. of Applications.	Area.
		Acres.
Coal	9	1571
Copper	15	938
Galena	1	40
Gold	187	1869
Iron	4	150
Lead	1	80
Limestone	2	50
Minerals	80	4074
Nickel	2	60
Osmiridium	4	237
Shale	4	1020
Silver	14	476
Tin	210	6562
Wolfram	1	20
Machinery Sites	14	96
Dredging Claims	11	156
TOTAL	559	17,399

In addition to the above, 18 applications for Mining Easements, and 76 applications for Water Rights (316 Sluice-heads and 91 acres Dam and Dump Sites) were received.

No. 21.

RETURN showing the total Amount of Rents, Fees, &c., received by the Mines Department during the Year ending 30th June, 1903.

Head of Revenue.	Amount.		
	£	s.	d
Rent under "The Mining Act, 1900," for gold and Minerals	16,509	15	1
Fees, ditto ditto	1266	19	2
Survey Fees	2772	15	1
Rent of Diamond-drills	—		
TOTAL	20,549	9	4

No. 22.

RETURN showing the Amounts paid in Dividends by Mining Companies during the Year ending 30th June, 1903.

Mines.	Dividends.
	£.
Copper	55,000
Gold	11,000
Tin	71,685
Silver	13,166
TOTAL	150,851

REPORT OF THE MOUNT CAMERON WATER-RACE BOARD FOR THE YEAR ENDING 30TH JUNE, 1903.

5th August, 1903.

SIR,

WE have the honour to present the Report of the Board for the year ending 30th June, 1903.

The total receipts for the year amount to £1283 7*s.* 4*d.*, as against £1142 18*s.* 1*d.*, and the expenditure to £765 5*s.* 6*d.*, as against £701 10*s.* 5*d.* during the preceding year.

The excess in the expenditure (£63 15*s.* 1*d.*) as compared with the previous year is mainly due to the cost of maintenance, race-repairing, flumings, &c., necessitating the employment, on full pay, of one of the watermen and channel keepers for the past six months (£31 4*s.* 0*d.*), who previously had only been employed on half-time; also to the cost of cleaning the race (£30 10*s.*), this latter work being only performed every other year.

Water.

With the exception of two brief periods during the months of November and February, the supply of water available was sufficient for all the customers.

The rainfall during the autumn and winter months was greater than that of any previous year during the life of the race, and the supply of water available was far in excess of the demand.

The condition of the race has already been brought under the notice of your predecessor in office as regards the syphon pipes on the northern extension, and the flumings near the source of intake. Estimates have been furnished by the manager as to the cost of renewal of the pipes (£9000) and of the flumings, by substituting cuttings and earth embankments, as more permanent and lasting, say, £3000. He reports that, with careful attention and repairs, the syphon pipes will be likely to last several years, and that their repair is not a matter of urgency at present; but the flumings are in such a state of decay and disrepair that they may collapse at any moment, and thus cut off the main intake supply, which represents two-thirds of the whole. The immediate renewal of this portion of the race by cuttings and embankments instead of flumings, as recommended by him, has become a work of pressing urgency, that requires immediate attention.

Race.

Syphon Pipes.—One hundred and three breaks have occurred during the year, as against 75 during last year. The actual cost of repairs, however, has been £8 10*s.* less; this is owing to the use of smaller bands, and their being applied as soon as the pipes begin to show signs of giving way.

It has been found by experience that small plate-iron bands, applied directly a small burst or hole in the pipes occurs, effectively prevents a more serious break, and obviates the necessity for using larger and more costly bands. This explains the reduction in the cost of material for repairs.

It is only when serious breaks occur during the night-time, and are not detected for several hours, that any great difficulty is experienced, as in such cases the water has to be turned off, and larger bands have to be applied.

The general condition of the pipes is not good, yet, from the experience of the last two years it is not anticipated that the annual cost of repairs for the next three or four years will be much greater than that of the past year.

Flumings.—There are 23 of these on the first five miles of the race, from the main intake on the Great Mussel Roe River to the Little Mussel Roe River; also one high fluming over Old Chum Creek, five miles lower down the race. All of these are in a very defective state of repair. The timber for the most part, both boxes and trestling, are in an advanced state of decay. Repairs have been effected from time to time, by means of old boards on hand; these have now been used up, and to obtain and use new timber for further repairs would be both unsuitable and too costly. It is, therefore, almost certain that at least two-thirds of the total water-supply will be cut off through the collapse of these flumings within a year from now. If such a thing should happen, there will be no further need to hereafter consider the question of repairs to the syphon pipes, as the further one-third supply of water available from the Little Mussel Roe River would not pay for keeping them in repair.

The estimates for reconstructing these flumings, or substituting earth and stone embankments, as furnished two years ago by the manager of the race, and afterwards verified by Mr. K. L. Rahbek, hydraulic engineer, amounted to £2859 8*s*., or, including supervision, &c., say, £3000.

There are also three short syphons spanning gullies on the same section of race as the flumings referred to, but renewal of these will not be required for several years to come.

With the expenditure of the sum above referred to, the race can be put in an efficient state of repair from the main intake on the Great Mussel Roe River to the "junction" (near the intake of No. 4 syphon, northern extension), a distance of 18 miles, and would thus become a permanent work. No further outlay would be required on this portion of the race, except for the three syphons referred to. If this scheme were adopted, it would insure a full supply of water being brought to the southern margin of the tin-mining areas, and to within five miles of Gladstone, in a direct line.

We beg, therefore, to respectfully bring under your notice this most important work, and to strongly recommend the renewal of the flumings by embankments be put in hand at once. If the payment of the annual subsidy to the Public Debts Sinking Fund is suspended for a time, and a sum of £3000 is advanced to the Board for a term of six years, the whole amount can be refunded within that time from the profits of the sale of water. A scheme has already been submitted by the Board for the consideration of your predecessor, a copy of which is appended hereto, and, if adopted, the State will be in possession of a permanent and substantial race of over 18 miles in length, and the water, as already stated, will be brought to within five miles of Gladstone.

Should the syphon pipes (Nos. 4, 5, and 6) collapse, and the Government decide not to renew them, at a cost of £9000, the prospects of the district would warrant the mine-owners putting in races at their own cost to connect with the Government Race, and purchasing and conveying the water to their mines, and relieve the State of any further liability. On the other hand, should the flumings not be renewed, their collapse, and the cutting off of the sources of the water-supply, would not only mean the collapse of the race, but the total collapse of the tin-mining industry of the district, which is solely dependent upon the Government race for its existence, and the loss to the State of a work of national importance, which has cost over £34,000.

Since the opening of the race the system of mining, as carried on on the claims supplied by the race, has been confined to shallow alluvial mining; but now the deep leads are being worked, and a commencement has been made to open up the deep leads which exist, and already one mine is in course of development, which, during the past year, has taken more than half the water-supply, and the future prospects of this mine warrant us in believing that, during the coming year, its demand for water will be largely increased, and that the whole of the water-supply will be taken to meet the requirements of this and the other claim-holders hitherto supplied.

Reviewing all the circumstances connected with this work, and the future prospects of the deep alluvial mining in the locality, we feel fully justified in recommending to your favourable consideration the proposal we have submitted for the advance of the necessary £3000 required to make the race a permanent and enduring work.

We cannot close this Report without referring to the very able and satisfactory manner in which the manager has discharged his duties, and to the deep interest he has always exhibited in the progress of the work; also the watermen and channel keepers employed on the race.

The statistics for the year are as follows :—

Average per week of claims supplied, 12.

Greatest number supplied in any one week, 16.

Total number of heads of water supplied—

Under fixed or cash scale, 2234½, at an average of 9*s*. 6*d*. and one-sixth per head; under royalty or credit scale, 1280, at an average of 3*s*. 8*d*. and four-fifths per head. Total, 3514½.

Tin-ore raised, 12 tons 13 cwts. 2 qrs. 5 lbs., royalty scale; 59 tons 4 cwts. 0 qrs. 0 lbs., fixed scale. Total, 71 tons 17 cwts 2 qrs. 5 lbs.

Average number of miners employed—European, 33; Chinese, 9. Total, 42.

Total receipts for the year—Fixed scale, £1044 4*s*. 1*d*.; royalty scale, £239 3*s*. 3*d*. Total, 1283 7*s*. 4*d*.

Expenditure :—Cost of maintenance and management—

	£	*s*.	*d*.
Salary and wages	634	18	0
Cleaning race-channel	30	10	0
Repairs to syphon pipes	33	19	1
Repairs to race and flumings	36	0	9
Travelling expenses	22	7	2
Insurance and stationery	7	10	6
TOTAL	£765	5	6

Paid to Public Debts Sinking Fund, 1902 (including moiety of rents of mineral land served by the race, £17 7*s.* 6*d.*), £452 10*s.* 10*d.*

Total amount paid to Public Debts Sinking Fund on the 31st December, 1902, £7623 18*s.* 7*d.*

Rate of interest for the year upon the cost of purchase and construction, 1·32 per cent.

Total cost of purchase and construction, £34,281 19*s.* 0*d.*

W. H. WALLACE, *Chairman of the Board.*
W. H. TWELVETREES,
C. O'REILLY,
S. HAWKES,
JOHN SIMPSON, } *Members of the Board.*

The Hon. the Minister of Mines.

APPENDIX.

1. That "The Mount Cameron Water-race Act" be amended, so that the annual payment to the Public Debts Sinking Fund may be suspended for a term of, say, eight years.

2. That the Board be empowered to borrow from the Government the sum of £3000, at, say, 4 per cent., redeemable in eight years, from the earnings of the race during that period.

3. That the sum of £3000 so borrowed be expended in renewing and replacing by embankments the 23 flumings on the southern extension of race, and the one flume on Old Chum Creek, according to the plans and specifications prepared by the manager, and that the work be commenced not later than August of the current year.

This work can be performed without cutting off the water altogether, or, indeed, without any great loss, beyond the cost of temporarily diverting the water at three or four places where the new work must be laid on the old course.

MINE MANAGERS' EXAMINATION.

MARCH 25TH, 1903.

Questions set.

SUBJECT A.—MINING.

1. Explain by description and diagrams the method by which a shaft 12 feet long by 5 feet wide may be divided into three compartments—(*a*) by frame sets and laths; (*b*) by close timbering, in order that two of its compartments may be utilised as an upcast and downcast respectively; (*c*) how would you proceed to open a plat or chamber in a close-timbered shaft in heavy ground?
2. At the 200-feet level of a shaft a 12-inch plunger workings is fixed, and it is intended to continue sinking. State the dimensions of a draw-lift suitable for the work, assuming the whole of the water is making in bottom of shaft.
3. Make a rough pen-and-ink sketch of the following :—
    (*a*) "Face board," used in driving through watery strata;
    (*b*) Half-set of timber for drive or stopes;
    (*c*) Full set of timber for drive or stopes;
    (*d*) Square sets (American system);
    (*e*) "Air sollar."
4. State the conditions under which deep lode mining can be more profitably conducted through underlie shafts than by means of vertical shafts.
5. State the advantages (if any) of a four (4) compartment main shaft.
6. Name the most commonly occurring noxious gases in lode mines. Describe their properties, means of recognition, the conditions under which they are produced, the means of preventing their generation, and of removing them when present.
7. How would you timber a drive on a lode in swelling ground, and how with a soft bottom?
8. How would you place the parts of a Cornish pump in a main shaft when the water was expected to be cut in bursts?
9. What system of ventilation would you use in a deep mine?—Explain by adding sketches to the text of your answer. Take into consideration the cost of carrying out your proposals.
10. How would you open up a large ore-deposit :—
    (1) If it was soft picking ground?
    (2) If it was hard blasting ground?
11. Give complete details of what you consider the best system of signalling in a shaft, and what is chiefly necessary to insure safety from accidents with speed in working.

12. How would you timber and work stopes on a lode about 10 feet wide :—
    (1) With good strong walls?
    (2) With baulky walls?
13. What sanitary rules would you enforce underground, and what sanitary arrangements would you make?

SUBJECT B.—ORE-DRESSING AND SAMPLING.

1. Which is the best type of rock-breaker made? Why?
2. How much water do you want per ton of ore in different ore-dressing plants?
3. Give your reasons for or against classifying fine sands and slimes before treatment. Give sketches of classifying for a silver-lead plant of assumed capacity, or your method of treatment.
4. How would you decide about placing an ore-dressing plant near to or at some distance from the mine?
5. State the principal circumstances which are the cause of the loss of ore in dressing.
6. Give the principles of the chlorination process for extracting gold; also a case in which the process is not applicable.
7. A quartz-reef in a drive has been sampled in five places 10 feet apart—

No. 1 sample, reef 5 inches wide, assayed 80 dwts. of gold per ton.
„ 2 „ 10 „ „ 40 „ „
„ 3 „ 20 „ „ 20 „ „
„ 4 „ 40 „ „ 10 „ „
„ 5 „ 80 „ „ 5 „ „

State average width of reef, and average gold contents over width of reef.

SUBJECT C.—MINING GEOLOGY.

1. Describe tests for the identification of stibnite, pyromorphite, chalcopyrite, cerussite, cassiterite.
2. Mention the different modes of occurrence of gold deposits.
3. Distinguish between basalt and serpentine, granite and melaphyre, conglomerate and breccia, schist and slate.
4. Mention what you know about the groupings or association of various minerals in ore veins.
5. Give a brief account of the changes which take place in different ore deposits at increasing depths from the surface.
6. Describe the indications which you would seek in prospecting for minerals in a new country.
7. Describe the ore deposits known as—(*a*) placers, (*b*) stockworks, (*c*) gash veins, (*d*) bedded veins.
8. When the course of a lode is changed by a fault, how would you proceed to pick up the heaved portion of the former?
9. Explain the terms :—hade, dip, elvan, sill, flucan, gossan, talus, strike, fault.

SUBJECT D.—MINING SURVEYING.

1. Calculate the bearing and distance of the line *E A* in the following traverse :—

Line.	Bearing.	Distance.
A B	N. 35° 25′ E.	500
B C	S. 31° 30′ E.	587
C D	S. 10° 48′ W.	633
D E	W.	475

2. Explain how such a traverse can be plotted by rectangular co-ordinates.

3. Describe carefully the adjustments of the transit theodolite.

4. The following observations were taken with a theodolite and chain, the distances being measured parallel to the line of sight of the theodolite. Calculate the difference of level of *A* and *E* :—

	Distance.	Angle of inclination.
A to *B*	85′	10° 15′
B to *C*	183′	16° 38′
C to *D*	115′ 6″	17° 43′
D to *E*	137′ 3″	28° 37′

5. Describe carefully how to connect the underground workings of a mine with the surface, there being one vertical shaft. How is it possible to check the accuracy of the underground observations?

6. In a triangle, *ABC*, the sides *BA AC* are each 1000 feet long, and the side *BC* 400 feet. It is required to cut off a portion containing two acres by a line parallel to *BC*. Calculate where this line will cut *AB*.

7. Reduce the levels in the section given below. Show how your calculations may be checked.

Back sight.	Intermediate.	Fore sight.
10·26	...	...
...	8·53	...
...	6·29	...
2·10	...	4·78
...	4·76	...
5·13	...	5·31
...	3·19	...
1·18	...	2·24
...	1·19	...
...	3·57	...
5·70	...	5·35
...	4·93	...
...	...	4·05

8. Describe carefully the adjustments of the surveyor's level.

SUBJECT E.—SURFACE WORK.

1. Give working drawings, specifications, and estimate for a shed capable of being used as a storehouse, composed of hardwood framing and galvanised iron exterior, 16 feet by 24 feet inside measurement, deal floor, one door, enough window area for ordinary lighting.

2. It is proposed to put a dam for impounding water across the bed of a stream flowing over granite country. The length along top will be 40 feet, and the height in centre 12 feet. Describe the material of which it should be composed and the method of construction. You can assume as available the material you specify. Illustrate your answer with sketches.

3. It is required to carry a flume capable of holding water of a transverse section of 8 square feet across a gully 60 feet wide. Give working-drawings of the fluming and trestles required.

4. A line of 9-inch wrought iron pipes ¾ mile long conveys water from a reservoir to some mining works. The water-level at the reservoir is 100 feet above the works. What will be the head of water available at the works? How many gallons per minute can the pipe discharge?

5. In the last question, what should be the thickness of the pipes, size of flanges and bolts? What will be the total weight of the line of pipes?

6. Explain fully the difference between the terms—(1) "Nominal," (2) "Indicated," (3) "Brake," horse-power.

7. At the bottom of an ordinary 400-gallon tank there is fixed a short piece of ¾-inch pipe (1 inch long) giving a clear ¾-inch orifice. Into this tank, when it is empty, a tap

discharging at the rate of 750 gallons of water per hour is set running. To what height will the water rise in the tank? Show how this has a bearing on the quetion of the utilisation of water-power.

8. Make a sketch of, and mark in the sizes for, a length of cast-iron rising main, 12 inches internal diameter, suitable for a head of 200 feet (ordinary pole-pumps).
9. What would be the weight of the above casting?
10. Show how you would calculate the stress required to break an ordinary screwed iron ¾-inch bolt.

SUBJECT F.—BOOK-KEEPING AND MINE ACCOUNTS.

1. Divide £65 among three persons so that their shares may be as the numbers 2. 3, 4.
2. Enumerate and give specimens of the several accounts which, as mining manager, you would furnish periodically to the head office of the company.
3. What is the tributor's part of £72 15*s*. 6*d*. at 5*s*. 7*d*. per £?
4. In making your analyses of costs, to what accounts would you debit work done in—(*a*) shafts, (*b*) crosscuts, (*c*) stopes?
5. Describe the books and forms of account which you consider desirable for controlling the receipt and distribution of stores.

SUBJECT G.—MINING LAW.

1. What is required to be done to abandoned shafts and shafts or excavations near roads to prevent accidents?
2. How are leased claims required to be marked during the term of the Lease?
3. What constitutes a "sluice-head" of water under the Mining Regulations?
4. What portion of land held under lease may be marked off by the Lessee as a "mining reserve"?
5. How often is a mine manager required to inspect ropes, safety appliances, &c.?
6. When a shaft of 50 feet or more in depth is the sole means of ingress into or egress from any part of a mine, what other provision for raising or lowering men is required by the Mining Act in addition to a safety cage or other machine?

ANNUAL REPORT OF THE GOVERNMENT GEOLOGIST.

Government Geologist's Office,
Launceston, 30th June, 1903.

SIR,

I HAVE the honour to submit my Annual Report as Government Geologist, for the year ending 30th June, instant.

During the year, besides departmental reports, I have prepared the following reports on mines and mineral districts :—

1. On the Den Hill gold deposits, 10th October, 1902.
2. On the possible existence of kainit and related salts in Tasmania, 25th November, 1902.
3. On the mineral resources of the Districts of Beaconsfield and Salisbury, 13th March, 1903.
4. On the present position of the Tasmania Mine, Beaconsfield, 8th May, 1903.
5. On possible coal country at Swan Bay and Saltwater Creek, on the River Tamar, 26th May, 1903.

In addition to the above, I examined, in March and April, the shale and coal measures at Preolenna (south of Wynyard); the Long Plains gold field, the Savage River copper deposits, the Heazlewood and Magnet mineral districts, the Badger tin field (near Waratah), and the iron-ore deposits near Penguin and on the Dial Range, as well as some iron-ore up the River Forth. Reports upon the results of these examinations are in course of preparation.

Mr. Geo. A. Waller, Assistant Government Geologist, has also written reports upon mineral districts on the West Coast, as under :—

1. On the tin-ore deposits of Mount Heemskirk, 5th September, 1902.
2. On the Western Silver Mine, Zeehan, 27th September, 1902.
3. On the iron and zinc-lead ore deposits of the Comstock district, 1st February, 1903.

Mr. Waller's reports and inspections during the year are alluded to in his Annual Report, which I beg to enclose. They comprise a very thorough examination of the ore deposits and geology of the respective districts. He is just completing a report upon the Zeehan field, which will be accompanied by a highly-useful geological map of that area.

The reports and inspections have been made at the request of those interested in the development of the mineral resources of the different districts, and have had for their object the diffusion of correct knowledge bearing upon ore deposits. With changes in the market rates for metals, and improved means of access and transport, old fields receive fresh attention. In the light of fresh work carried out, renewed inspection is solicited, and information bearing upon the prospects of the field is the result. Many old districts need re-examination at present, *e.g.*, the Mathinna field, which has not been reported upon since 1892; the Mangana field, since 1894; the Lyndhurst field, since 1881;

whilst no reports at all have been published on the Panama and Golconda district. The resinous shales of the Latrobe area have not been examined since 1861.

The country between Emu Bay and Circular Head is very imperfectly known; and on the West Coast, the districts of Farrell, Dundas, and Lyell require examining. The important Lyell field has not been reported upon since 1894. Gold-bearing country is said to await examination in the vicinity of the Frenchman's Cap; other parts of the State, too, demand attention.

The reports have been published in plain language, the greatest stress being laid upon the economic relations of the various mineral deposits, purely scientific considerations being subordinated to the attempt to discuss facts relating to mines and mining in a manner suited to the intelligent reader. I submit, with some degree of confidence, that the reports constitute, as far as they go, a useful compendium of the mining geology and mineral resources of the State. I beg to refer briefly to the contents of the several reports issued.

Den Hill.

The old Den diggings were a scene of activity between 30 and 40 years ago, when a good deal of coarse gold was won from the alluvial flat. For many years an attempt has been perseveringly carried on to locate the supposed parent reefs in the spur which rises from the flat, but unsuccessfully. The inference is that the veins seen in the hill did not contribute materially to the alluvial deposit, and that the source of the gold must be sought elsewhere. The probability is, that the metal was derived from formations concealed below the alluvium. The strata form part of the Lefroy auriferous series, and, though things are quiet at present in the Den and Lefroy district, a revival of interest will certainly recur at some time or other; for it is folly to think that all the reefs are known, and the payable ground exhausted.

Beaconsfield and Salisbury.

This district was submitted to an examination primarily for coal measures, but the examination extended to the neglected iron-ore deposits, and to sundry gold mines. Sandstone strata of the geological horizon of the Mersey measures were recognised, and coal-markings found to exist here and there, but no outcrops of coal were observed, a circumstance which leaves the existence of seams a matter of uncertainty. The doubt can only be solved by the employment of the drill.

The iron ores at Leonardsburgh and Barnes' Hill form large deposits, easily quarried, but contaminated with a little chrome in variable proportions. In 1876-77 smelting was carried on at Port Lempriere, and about 20,000 tons of ore taken from the quarries, but the bulk of the product was hard and brittle, owing to the presence of chromium. It is conceived that new trials might now result in producing a metal useful for special purposes, and commanding special prices. The mines at the Salisbury Tier were visited. These were recently started to prospect the Tier, in which rich auriferous patches were worked formerly, and the alluvium from which constituted a notable goldfield in early days. One of the new companies extracted, in a very short time, 60 ozs.

of gold; but further work here has been suspended for the time, until fresh capital can be secured.

The reef in the east end of the Tasmania Mine was examined with reference to its continuation into the property of the East Tasmania Company, and the conclusion arrived at was that, to locate it in the latter company's ground, a series of diamond-drill bores would be necessary.

The Ophir Mine workings were found to have cut wash in the lead at 400 feet. The mine is being put in order for work at the 460-feet level.

Tasmania Mine.

This mine was inspected, at the company's request, with a view of verifying the grounds for a contemplated instalment of more powerful pumping-plant. Work at the 1000 and 1100 feet has been suspended since August last year, owing to a burst of water encountered in driving at the 1000-feet. There is every reason to believe that between the 818 and 1000 feet a large body of gold-bearing quartz exists, which awaits extraction, but cannot be profitably dealt with until an adequate pumping-plant is obtained, when still deeper exploration can be also undertaken.

Coal Country on the Tamar.

Operations have been recently going on in the lignite clays on the river-bank near Swan Bay, and this area was examined for indications of the true coal measures (upper or lower). No signs of seams were found, but the sandstones which underlie the lignite may possibly enclose coal deposits. Those interested in this work are about to test the ground by boring.

Kainit.

A report upon the probability of the occurrence of kainit and other potash salts was prepared for the Council of Agriculture, and was published in their journal.

Inspections.

The visit to Preolenna showed that seams of high-class kerosene shale and bituminous coal, up to 20 inches in thickness, exist about 17 miles south of Wynyard. The coal surpasses any other in the State in gas-making and steam-generating properties; and the shale is equal to the export quality of New South Wales kerosene shale. The distance from a port is a drawback which will eventually disappear with the extension of public tramways into the district.

At Long Plains some prospecting for gold has been carried on. The quantity of gold which was formerly obtained from this field stimulates continued search for its source.

At the Heazlewood silver-lead mining has been proceeding at Mount Stewart and Bell's Reward, and at the Confidence Mine.

Near Waratah, the Magnet Mine has continued regular consignments of an ore much sought by smelting companies; and a new tinfield, at the Badger, is being opened up.

At the Penguin, the Tasmanian Iron Company is breaking rich hematite ore, which is sold for fluxing purposes to the Smelting Works at Cockle Creek, New South Wales.

Iron ore deposits were also examined on the Dial Range, near Riana, and copper mines on the east side of the range. This district has not been adequately proved. It is geologically favourable for mineral lodes, and deserves attention.

Progress Reports on the Mineral Industry.

I have compiled four of these during the year. They have been favourably reviewed in the other States, and the demand for them abroad continues.

Examination of Minerals and Rocks.

Since the discontinuance of franking privileges, the number of specimens received for examination has decreased. All samples received are, however, tested (but not assayed), and an opinion is forwarded to the sender.

Office.

During the year eight geological and four progress reports have been issued, and the correspondence has amounted to 2160 letters, &c., in and out. Upwards of 300 yearly plans of underground surveys have been checked and indexed by Mr. F. S. Grove, whose services I duly acknowledge. The specimens in the office collection of minerals, rocks, and fossils, have been numbered, and a catalogue of them will be prepared. The receipt of specimens from Messrs. W. F. Petterd, W. R. Bell, T. C. Goodall, H. Conder, Cecil Hawley, Leslie Jolly, L. Simson, Sydney Thow, and Professor Gregory, is thankfully acknowledged.

Iron Bonus Committee.

On the 24th and 25th of September I attended the meeting of the Federal Iron Bonus Committee in Melbourne, and gave evidence as to the iron ore resources of Tasmania. The deposits mentioned embrace those of the Blythe, the Penguin, and other parts of the North-West Coast; those near Beaconsfield; the iron ore outcrops of the Savage and Meredith Rivers; at the South Heemskirk; and deposits along the West Coast range.

Government Drills.

I beg to annex copies of the boring registers of the two diamond-drills for the past year; the cores are labelled and stored. No. 1 drill has been employed at the Catamaran River, and on the Moss Glen coalfield, Recherche Bay; No. 2 was at work at Eden and Farm Cove.

Catamaran Borings.

A broad plain of coal-measure sandstone exists south of the Catamaran River. In the northern part of this the existence of coal in the form of a small seam had been established by a shallow shaft on Mr. McDougall's 38-acre section, and it was decided to put down two bores on the plain, while a syndicate prepared a track for the drill, which was to prospect its claim with a good seam on the north side of the river. The first bore was started on the 21st of July last, at the site marked No. 8 on the map accompanying my report on the coalfield in the neighbourhood of Recherche Bay. It was sunk to a depth of 229 feet 10 inches; at 161 feet, shale, with coal-markings, was passed through; and, at 216 feet 6 inches, eruptive rock (diabase) was entered, and continued to the depth above-mentioned. The contact of the sedimentary rock with the diabase was formed by a band of clay 1½ feet in thickness, containing vesicles and amygdules of calcite. The second bore was begun at the No. 7 site, further west, on the 22nd of September, and continued to a depth of 726 feet. It passed through sandstones and shales, with occasional coal-markings, and entered fine-grained diabase at 695 feet, in which it remained till operations were suspended. It is evident that a flow of diabase underlies this plain, and the boring work shows that, in that part of the field, at any rate, no continuous deposit of coal exists.

Coal seams, however, are known both north and south of this, and I do not look upon the experience with the drill as excluding the possibility of good seams yet being found under this area.

Moss Glen Borings.

The Moss Glen Company has been prospecting its coal seams, with its own hand-boring plant, but these were found to be cut off frequently by diabase intrusions. The Government drill was put to work at two sites; one near the shore of Recherche Bay, at sea-level, and the other 200 feet up the mountain, a little ahead of the faulted seam. The lower bore was begun on the 2nd of March, and was continued to 515 feet. It passed through sandstone and shale, with veinlets of coal, and struck the diabase at 454 feet 6 inches, which continued to the bottom of the bore.

The upper bore was started on the 27th of May, and was continued to a depth of 152 feet, leaving off in sandstone with coal markings. At 56 feet 6 inches it entered a seam of coal and bands 8 feet 7 inches thick, but of poor quality, containing from 39 to 59·8 per cent. of mineral matter (as per analysis by the Government Analyst). Coal markings and veinlets of coal were met with throughout the bore, and at 104 feet 4 inches of coal were passed through. Boring was discontinued before a depth was attained sufficient to properly prove these strata.

Eden.

The No. 2 drill was started on the 28th July at the second site on the Eden Coal Company's section, and a depth of 110 feet was bored in sandstone and slate, with unfavourable indications. Although these trials have not been successful, the existence of coal-measure plants at the Henty makes it probable that coal will be found somewhere in this area.

Farm Cove Boring.

The No. 2 drill was employed boring near Farm Cove, Macquarie Harbour, in the Tertiary clays, sandstones, and shales, with a view to pierce these, and test the supposed underlying Permo-Carboniferous strata for seams of coal. The bore was started on the 11th of November, and taken down to a depth of 571 feet, leaving off in white clay. Occasional bands of lignite were passed through, the most important one being a seam 3 feet 10 inches in thickness at 9 feet 5 inches from the surface. The question whether coal-measures underlie the Tertiary ligneous beds here is still unsettled.

All the above boring operations were executed by arrangement with companies interested in the discovery of coal, and the expenses were partly borne by these.

Alluvial Boring Plant.

This has been let out on hire to the Pioneer and Ringarooma Tin Mines for their exploratory boring. The Pioneer Company had it for 25 weeks from the 5th of July last, and the Ringarooma Tin Mine for 18 weeks from the 21st of January. It is now stored at the Ringarooma Mine.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES,
Government Geologist.

W. H. Wallace, Esq.,
Secretary for Mines, Hobart.

No. 1 Diamond Drill.

RECHERCHE.

Catamaran No. 1 Bore.

Commenced 21st July, 1902; finished 5th September, 1902. Total depth bored, 229 feet 10 inches.

Nature of Strata bored through.	Thickness of Strata.		Total Depth.	
	ft.	in.	ft.	in.
Clay, surface	7	0	7	0
Diabase, boulders	11	2	18	2
Sandstone, floating	1	0	19	2
Shingle and boulders	0	6	19	8
Shale, soft, dark-coloured mud	2	4	22	0
Shale, hard, dark	2	2	24	2
Shale, dark and blue, soft broken	2	1	44	3
Shale, dark, and very hard	0	8	44	11
Shale, hard blue	8	7	53	6
Sandstone, hard grey	7	6	61	0
Sandstone, hard brown and blue, broken	45	0	106	0
Sandstone, hard brown, broken	29	0	135	0
Sandstone, solid	6	11	141	11
Shale, broken	9	4	151	3
Sandstone, broken	8	3	159	6
Shale, broken	1	6	161	0
Shale, broken, with coal-markings	9	3	170	3
Shale, blue and dark-coloured	10	9	181	0
Shale, blue	8	0	189	0
Sandstone, broken	4	10	193	10
Shale, pink and green talcose? penetrated by pink and white radiating zeolites in alternate bands	4	2	198	0
Shale and sandstone, broken	10	6	208	6
Shale, broken	6	6	215	0
Clay, with scattered vesicles and amygdules of calcite	1	6	216	6
Diabase	13	4	229	10

No. 1 Diamond Drill.

RECHERCHE.

CATAMARAN No. 2 BORE.

Commenced 22nd September, 1902; finished 17th December, 1902.
Total depth of bore, 726 feet 6 inches.

Nature of Strata bored through.	Thickness of Strata.		Total Depth.*	
	ft.	in.	ft.	in.
Clay, surface sandy	8	0	8	0
Shale, light-coloured micaceous	6	0	14	0
Clay, light micaceous, containing small nodules of dark clay	32	0	46	0
Sandstone, white crystalline or saccharoidal	4	0	50	0
Sandstone, soft white micaceous	35	6	85	6
Conglomerate, white sandstone	1	6	87	0
Sandstone, white, with mica and micaceous iron in joint planes	5	0	92	0
Sandstone, white, with mica and micaceous iron	25	0	117	0
Sandstone, white crystalline, with mica and micaceous iron	14	0	131	0
Shale, white sandy	16	0	147	0
Sandstone, white crystalline	13	6	160	6
Sandstone, white micaceous	12	0	172	6
Sandstone, white, with flakes of specular iron.	14	0	186	6
Sandstone, white	38	0	224	6
Sandstone, yellowish, with mica and specular iron	23	6	248	0
Shale, grey micaceous	9	0	257	0
Sandstone, white, with specular iron	9	0	266	0
Sandstone, white	34	0	300	0
Sandstone, oxidised	1	0	301	0
Sandstone, white	12	10	313	10
Sandstone, white, with iron pyrites and specular iron	6	1	319	11
Shale, sandy	1	6	321	5
Shale, with very faint coal-markings	29	3	350	8
Sandstone, with micaceous iron	12	10	363	6
Shale, grey, with a little pyrites	11	0	374	6
Shale, dark grey	13	3	387	9
Shale, white sandy, with a little specular iron.	5	7	393	4
Sandstone, grey clayey, with much specular iron	56	8	450	0
Sandstone, with white micaceous iron	25	3	475	3
Sandstone, broken	18	1	493	4
Shale, grey	36	8	530	0
Sandstone, hard, with white micaceous iron.	40	0	570	0
Sandstone, white	22	0	592	0
Rock, doubtful contact, with calcite	6	0	598	0
Sandstone, light grey	34	0	632	0
Rock, doubtful contact, with calcite	12	0	644	0
Quartzite, with fine impregnation of pyrites.	12	6	656	6
Shale, light sandy	16	3	672	9
Sandstone, blue, hard and broken	16	0	688	9
Diabase, fine-grained	12	9	701	6
Diabase, altered, almost wholly replaced with calcite veins	25	0	726	6

No. 1 Diamond Drill.

RECHERCHE.

MOSS GLEN No. 1 BORE.

Commenced 2nd March. 1903; finished 22nd April, 1903. Total depth bored, 515 feet.

Nature of Strata bored through.	Thickness of Strata. ft.	in.		Total Depth. ft.	in.
Clay and sand, surface	3	0	...	3	0
Shingle	1	0	...	4	0
Sandstone, soft	2	0	...	6	0
Sandstone, felspathic, with coal-markings	84	0	...	90	0
Sandstone, solid	11	3	...	101	3
Sandstone and shale	5	4	...	106	7
Sandstone, dark broken felspathic, with coal-markings	7	8	...	114	3
Sandstone, with a little shale intermixed	15	9	...	130	0
Sandstone, felspathic, with coal-markings	21	0	...	151	0
Shale, carbonaceous	7	0	...	158	0
Sandstone and shale	7	0	...	165	0
Sandstone, felspathic, with coal-markings	32	6	...	197	6
Sandstone, broken	3	2	...	200	8
Shale, with coal-veins	1	8	...	202	4
Sandstone, felspathic, with coal-markings	43	8	...	246	0
Shale, dark	7	0	...	253	0
Coal, bright	0	6	...	253	6
Shale, dark sandy, with small veins of coal	7	8	...	261	2
Shale, dark sandy	3	0	...	264	2
Shale, sandy	8	1	...	272	3
Sandstone, felspathic	47	1	...	319	4
Sandstone, felspathic, with coal-markings	7	8	...	327	0
Shale, dark, with small veins of coal	14	2	...	341	2
Coal, bright	0	4	...	341	6
Shale, with veins of coal	1	2	...	342	8
Shale, dark clayey	7	0	...	349	8
Shale, dark sandy	13	6	...	363	2
Shale, dark clayey	9	2	...	372	4
Shale, dark	1	2	...	373	6
Coal	0	6	...	374	0
Shale	0	4	...	374	4
Coal	0	8	...	375	0
Shale, dark clayey	4	9	...	379	9
Shale, clayey, with veins of coal	9	8	...	389	5
Shale, dark clayey	7	7	...	397	0
Shale, dark	10	0	...	407	0
Sandstone, felspathic	14	0	...	421	0
Shale, dark micaceous	13	0	...	434	0
Sandstone, felspathic	13	0	...	447	0
Sandstone and shale	3	8	...	450	8
Shale, brecciated	3	10	...	454	6
Diabase, broken	1	6	...	456	0
Diabase, fine-grained	59	0	...	515	0

No. 1 Diamond Drill.

RECHERCHE.

MOSS GLEN NO. 2 BORE.

Commenced, 27th May, 1903; finished, 28th June, 1903. Total depth bored, 152 feet.

Nature of Strata bored through.	Thickness of Strata		Total Depth.	
	ft.	in.	ft.	in.
Surface soil and white clay	8	0	8	0
Clay, white and yellow	16	0	24	0
Boulders, shingle, and clay	4	0	28	0
Shale, soft white, clayey	4	0	32	0
Shale, soft brown clayey	19	0	51	0
Clay, carbonaceous	4	0	55	0
Shale, soft, with veins of coal	1	6	56	6
Band	0	8	57	2
Coal	0	10	58	0
Band	0	4	58	4
Coal	0	6	58	10
Band	0	3	59	1
Coal	0	2	59	3
Band	0	4	59	7
Coal	0	3	59	10
Band	0	6	60	4
Coal	0	3	60	7
Band	0	5	61	0
Coal	0	9	61	9
Band	0	4	62	1
Coal	0	7	62	8
Band	0	2	62	10
Coal	0	6	63	4
Band	1	6	64	10
Coal	0	3	65	1
Clay, white, with veins of coal	6	8	71	9
Clay, white and brown, with veins of coal	6	6	78	3
Shale, soft micaceous	25	9	104	0
Coal	0	4	104	4
Limestone	0	5	104	9
Sandstone and shale, dark	2	3	107	0
Shale, dark, with small veins of coal	2	6	109	6
Shale, soft blue	1	7	111	1
Conglomerate	5	8	116	9
Shale, dark blue and brown	9	3	126	0
Sandstone, felspathic, with coal-markings	26	0	152	0

No. 2 Diamond Drill.

EDEN BORE NO. 2.

Commenced, 28th July, 1902; finished, 26th August, 1902. Total depth bored, 110 feet.

Nature of Strata bored through.	Thickness of Strata.		Total Depth.	
	ft.	in.	ft.	in.
Surface soil	8	0	8	0
Sandstone, soft friable	74	3	82	3
Sandstone, very broken	15	3	97	6
Sandstone, hard, broken	10	6	108	0
Slate, indurated, hard, and broken up	2	0	110	0

No. 2 Diamond Drill.

FARM COVE BORE.

Commenced, 11th November, 1902; finished, 23rd January, 1903.
Total depth, 571 feet.

Nature of Strata bored through.	Thickness of Strata.		Total Depth.	
	ft.	in.	ft.	in.
Surface soil and sandy clay	6	6	6	6
Lignite	0	6	7	0
Clay, sandy	4	11	11	11
Lignite	0	11	12	10
Clay	0	1	12	11
Lignite	0	9	13	8
Clay	0	6	14	2
Lignite	0	4	14	6
Clay	0	6	15	0
Lignite	0	9	15	9
Shale, soft grey, clayey	18	1	33	10
Shale, dark, full of carboniferous matter	1	6	35	4
Shale, grey, very soft	13	4	48	8
Drift, coarse bluish-grey	10	3	58	11
Shale, dark clayey	7	9	66	8
Shale, dark sandy, carboniferous	9	3	75	11
Shale, grey	5	0	80	11
Shale, dark sandy	3	1	84	0
Shale, light sandy	3	9	87	9
Shale, very hard brown	0	6	88	3
Sandstone, light and dark, very soft and friable	92	7	180	10
Lignite	0	5	181	3
Sandstone, soft friable dark	44	0	225	3
Sandstone, firm brown	1	4	226	7
Sandstone, soft friable brown	15	9	242	4
Clay	0	9	243	1
Lignite	0	3	243	4
Clay, soft grey	3	0	246	4
Sandstone, dark soft friable	29	6	275	10
Clay, white sandy	3	0	278	10
Sandstone, firm brown, showing leaf impressions	0	10	279	8
Sandstone, dark soft and friable	26	9	306	5
Rock, light yellow	0	4	306	9
Clay, white sandy	10	0	316	9
Sandstone, dark soft and friable	4	4	321	1
Clay, white sandy	33	5	354	6
Sandstone, showing very thin bands of lignite	5	8	360	2
Clay, white sandy	47	11	408	1
Sandstone, firm grey	0	9	408	10
Sandstone, dark soft friable	4	10	413	8
Lignite	0	2	413	10
Sandstone, dark soft friable	30	5	444	3
Clay, soft grey sandy	7	11	452	2
Sand, clayey, very soft and white	26	3	478	5
Sandstone, grey hard	1	0	479	5
Sand, clayey, very soft and white	26	1	505	6
Sandstone, soft, dark	5	0	510	6
Lignite	0	5	510	11
Sandstone, firm grey, showing fern impressions	1	6	512	5
Sandstone, soft dark	42	7	555	0
Clay, soft grey sandy	16	0	571	0

DIAMOND DRILLS.

Statement of work done during the year ending 30th June, 1903.

Locality.	Direction of Bore.	Number of Bores.	Total Distance Bored.	Average cost per foot inclusive of labour & fuel
			ft. in.	£ s. d.
No. 1 Drill.				
Recherche (Catamaran).	Vertical	2	956 4	0 9 3
„ (Moss Glen).	„	2	667 0	0 7 6
No. 2 Drill.				
Eden	Vertical	1	110 0	1 3 0
Farm Cove.....	„	1	571 0	0 5 6
TOTAL	...	6	2304 4	

NOTE.—The above cost is calculated upon the running time only, and the diamonds are reckoned at £10 per carat.

W. H. TWELVETREES,
Government Geologist.

ANNUAL REPORT OF THE ASSISTANT GOVERNMENT GEOLOGIST.

Zeehan, 30th June, 1903.

SIR,

I HAVE the honor to forward you the following report on the work done by me during the year ending 30th June, 1903.

During this period I have been engaged exclusively in geological work on the West Coast, the districts examined being as follows:—

(1) The Heemskirk tin-mining district.
(2) The Comstock zinc-lead mining district.
(3) The Zeehan silver-lead mining district.

My reports on the first two districts named have already been published. They contain a fairly exhaustive account of the geology of these districts, especially as regards the mining geology. All the discoveries have been described in detail, and topographical and geological plans have been prepared of the principal mines. It is most satisfactory to note that there appears every likelihood of there being a considerable influx of capital into both of these districts in the near future. As I have pointed out in my reports, both of these districts present features of very exceptional interest to the mining geologist. The Comstock district in particular affords what I have reason to believe will prove to be the clue to the origin of the Zeehan silver-lead lodes, and I believe that the conclusions which I was able to draw from the evidence presented will have a very extensive application to other types of ore deposits on the West Coast.

For the last six months I have been engaged in the Zeehan district. I have already made an exhaustive examination of all the mines which are at present accessible, and have almost completed a geological plan of the field. This plan will include an area of 16 square miles, and will give the geological and topographical features, lode formations, mine openings, roads, tramways, tracks, &c. The plan will, I believe, be a valuable aid to the mining community, and especially will be of assistance to prospectors, who will be able to locate almost all the lode formations which are at present known in the district. This plan will be ready for publication in a few weeks' time, and will be published before my report on the Zeehan district, which will still take some time to prepare.

In addition to the reports mentioned above, I forwarded you, on the 27th September, 1902, a report on the Western Silver Mine, Zeehan. This mine was examined during the previous year, before it was closed down. I understand that the mine will shortly be re-opened, a new company having been formed in London, with an efficient working capital.

I have the honour to be,
Sir,
Your obedient Servant,

GEORGE A. WALLER,
Assistant Government Geologist.

W. H. WALLACE, ESQ.,
Secretary for Mines, Hobart.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF MINES.

Inspector of Mines Office,
Launceston, 30th June, 1903.

SIR,

I HAVE the honour to submit my Annual Report on the inspection of mines for the year ending 30th June instant.

I beg to enclose the yearly reports of Mr. M. J. Griffin, Inspector of Mines for the Northern, Eastern, and North-Eastern Divisions; of Mr. Jas. Harrison, Inspector of Mines for the Western and North-Western Divisions; and of Mr. C. H. Curtain, Inspector of Mines for the Lyell and Darwin Districts.

This year the number of men employed in the mines and smelting works of the State was 6484, compared with 6438 the previous year. The fatalities were 6, against 7 the preceding year; and other injuries 43, against 35 the year before. This results in a death rate from accidents of 0 ·925 per thousand, as against 1 ·088 per thousand the previous year.

The number of injuries sustained has been increased this year by inclusion of the accidents occurring at smelting works, these being for the year 9 men injured and 1 killed.

I append a comparative table giving the accident statistics for the past eleven years, and another classifying the accidents which took place in the year just ended. With our comparatively few miners it is unnecessary to represent the accidents graphically, as is often done, for the variations in the curve would be too abrupt to be of specially instructive value. The table shows the statistical features at a glance.

The percentage of accidents has not increased, as compared with ten years ago, though mining is carried on upon a much larger scale. I cannot, however, lay great stress on this, as a few accidents more or less have a sensible effect on the averages. Happily, the fatal accidents show a decrease compared with former years, and compare favourably with the other States.

In New South Wales the accident death rate for 1902 was 3 ·68 per thousand, raised abnormally by the disaster at the Mount Kembla Colliery; in Western Australia for 1902, 2 ·10; in New Zealand for 1902, 1 ·11; in Victoria for 1901, 1 ·11; in Queensland for 1901, 1 ·57 per thousand.

The Inspectors have, besides inspecting explosives and roads for other Departments, visited the mines in their respective districts regularly, and have discharged their responsible duties faithfully. If inspection had been less strenuous, some sources of serious danger would have continued. The calling of a miner, however, is inherently dangerous, and many mishaps are purely fortuitous, unpreventible by any amount of inspection; others are undeniably the result of carelessness on the part of the workmen, or spring from the parsimony of the mineowner. Special rules at the mine are designed to provide against some of these dangers; the general rules of the Mining Act deal with others; and the Inspector's duty is to take notice of cases where these rules are not observed, and to suggest additional precautions wherever necessary. The mineowners and mine managers are responsible for the actual operations, but the Inspectors' visits are beneficial in inciting those in charge to compliance with obvious precautions and in giving counsel when needed.

In three cases mining managers were ordered by the Inspectors to discontinue operations : in one case until better ventilation was provided, and in the others until alterations were made to secure the safety of workmen. Proceedings were taken in one instance against a mining manager for neglecting and refusing to fence or cover an abandoned shaft, and a fine was imposed by the Court. Many of these old shafts, left open and unprotected, are dangerous to limb or life, but it is not always easy to sheet the neglect home, as in numberless cases the sections are without occupiers.

There are some 200 mines and claims inspected by the three officers, but the distances at which some of them are situated prevent visits being made to the more remote ones as often as could be wished. Owing to its distance, the Mount Cygnet Coal Mine has not been inspected this year.

A complaint was made by two miners at one of the collieries, under Section 97 of the Act, in respect of timbering and ventilation. In the absence of Inspector Griffin, I visited the mine and made enquiry into the matters objected to, without divulging the names of the complainants. I found friction existing between manager and men, and called attention to one or two things where improvement was possible, but on the whole the complaints appeared to be unsupported by the facts.

Accidents in smelting work (such as were not purely machinery accidents) have been reported to and enquired into this year by Inspectors of Mines by Ministerial direction, and at the request of those concerned. The Act includes smelting works under its definition of mines, but perhaps the embodiment in it of some more definite reference is desirable.

Inspector Curtain in his annual report again expresses his opinion that the height of open-cuts should be regulated by law.

Inspector Harrison has made a suggestion to me that the rule as to the maximum quantity of explosives allowed to be stored in any mine could with advantage be amended so as to make the limit not so many days' consumption, but so many cases of material. In large mines the present rule permits a large quantity to be stored, an explosion of which might have disastrous consequences, and managers like to keep large quantities in their mines, as the temperature is suitable.

In the course of a trial, Allen *v.* the New Golden King Mining Co., N.L., the Judge at first commented adversely on Inspector Griffin's opinion that Subsection xiii. (signals) of Section 94 did not apply to shafts in course of sinking, but at the conclusion of the hearing, his Honor said he was doubtful whether the subsection really applied in this case. I think it right to mention this, as some of the press reports at the time did an injustice to the Inspector. The question of signals from the surface and along drives, as required by the Act, is receiving attention. I may say that the administration of the Act in general is governed by the requirement of Section 94, that the rules shall be observed as far as may be reasonably practicable. We are discussing now what is practicable or otherwise in this question of signals.

Inspector Griffin, in his report herewith, recommends the enactment of regulations providing for the daily and weekly inspection of coal mines by competent persons, the daily inspection to be made before each shift, with a view of ascertaining the state of ventilation and general safety of the mine; the weekly inspection to be made with a locked safety lamp for testing the presence of inflammable gas. He has drawn up a rule which he proposes for this purpose, and with which I am substanally in accord.

No accumulations of inflammable gas are known to exist in our coal mines; but no one can safely predict its absence with the continuous increase of pressure as the workings advance further under cover. It is true that the seams of our largest collieries are not fiery, and no one has any suspicion of the presence of gas, but the terrible explosions elsewhere, attended with lamentable loss of life, in mines believed to be entirely free from gas, make it, in my opinion, incumbent on the Department not to allow stupendous risks to be run. For the past year the question of taking extra precautions in this respect has been a subject of consultation with Inspector Griffin, and has given cause for anxious thought. The result of his enquiries is expressed in his report, and I have the honour to commend it to your consideration.

In terminating this report, I beg to mention and bring to your notice the assiduous and efficient services rendered during the year by the Inspectors in their several divisions.

I have the honor to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES,
Chief Inspector of Mines.

W. H. WALLACE, ESQ.,
Secretary for Mines, Hobart.

COMPARATIVE Table of Statistics of Accidents in and about the Mines of Tasmania from 1892 *to* 1903.

1st July to 30th June.	Number of Miners employed.	Number of Accidents.	Number of Persons.		Total killed and injured.	Average per 1000 killed and injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
1892-1893	3295	28	4	25	29	8·8001	1·214	7·586
1893-1894	3403	25	7	20	27	7·934	2·057	5·877
1894-1895	3789	26	4	24	28	7·390	1·058	6·332
1895-1896	4160	22	7	16	23	5·529	1·682	3·847
1896-1897	4303	36	7	31	38	8·831	1·627	7·204
1897-1898	5530	36	13	33	46	8·318	2·351	5·967
1898-1899	6180	35	9	34	43	6·957	1·456	5·501
1899-1900	6834	19	7	16	23	3·365	1·024	2·341
1900-1901	7017	29	8	23	31	4·417	1·140	3·278
1901-1902	6438	38	7	35	42	6·524	1·088	5·437
1902-1903	6484	44	6	43	49	7·557	0·925	6·632

TABLE showing the Number of Persons Killed and Injured in and about the Mines of Tasmania during the Year 1902-1903.

PLACE OR CAUSE OF ACCIDENT.	INSPECTION DISTRICT.													
	Northern and Southern Division.		North-Eastern Division.		Eastern Division.		North-Western Division.		Western Division.				TOTAL.	
									Zeehan and other Districts.		Lyell District.			
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
UNDERGROUND—														
Falls of Ground	1	1	...	...	...	2	...	...	...	2	...	2	1	7
Shaft Accidents—														
Suffocation by natural gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Overwinding	...	...	...	...	...	...	...	...	...	...	...	...	..	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	...	...	...	...	...	...	...	...		...	...	...	...	...
Falling in or into shafts.	...	1	...	...	...	...	...	...	...	1	...	...	...	2
Things falling into shafts	...	2	...	...	...	2	...	...	...	1	...	...	...	5
Explosives	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	1	...	...	...	1	...
Total	...	3	...	...	...	2	...	...	1	2	...	...	1	7

Miscellaneous (underground.)														
Explosives	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Suffocation by natural gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Haulage—														
On inclined planes	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
By trams and tubs	...	1	...	...	...	...	...	...	...	1	...	...	...	2
Machinery	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sundries	...	4	...	...	...	...	...	...	...	...	...	1	...	5
Total	...	5	...	...	...	...	...	...	...	1	...	1	...	7
Total underground	1	9	...	...	...	4	...	...	1	5	...	3	2	21
On Surface—														
Smelting Works	...	...	...	...	...	...	...	...	...	3	1	6	1	9
Machinery	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Boiler explosions	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Tramways	...	...	...	...	...	...	...	...	...	1	...	1	...	2
Explosives	...	...	...	...	..	...	...	...	...	1	...	...	...	1
Falls of ground	...	...	2	...	...	...	...	...	...	...	1	4	3	4
Miscellaneous	...	1	...	1	...	1	...	1	...	1	...	..	...	5
Total on surface	...	2	2	1	...	1	...	1	...	6	2	11	4	22
Gross Total, 1902-1903.	1	11	2	1	...	5	...	1	1	11	2	14	6	43
Total, 1901-1902	...	5	1	3	2	2	...	2	...	16	4	7	7	35

ANNUAL REPORTS OF THE INSPECTORS OF MINES.

Mr. Inspector **Harrison** (stationed at Zeehan), reports :—

In submitting my Annual Report to you, I regret to have to record one fatal accident, which took place on the 22nd June, when a miner named T. Kestles lost his life through the flooding of the Florence Mine. The inquest has been held over until the jury can get below and inspect the workings. Other accidents consisted of three serious and nine not serious, many of the latter being hardly worth recording.

Ropes and Cages.—Ropes and cages are in good working order —one rope was condemned during the year.

Ventilation.—I have had no complaints in this respect, but found it necessary in one instance to compel a manager to suspend operations until better ventilation was provided for his men.

Magazines.—Magazines are clean and in good order. Two new ones have been erected during the year, one at Williamsford and one at Mount Farrell.

Output.—The output from the district is now about 4000 tons per month, with every prospect of a steady increase.

Mines.

Zeehan Montana.—This mine is keeping up a steady output, with large reserves of ore in sight.

Mount Zeehan (Tas.)—The mine looking well throughout. The manager has started to sink two new main shafts during the year.

Comet.—This mine has been very unfortunate, having been flooded out a few months ago through the fluming over the creek getting carried away in a heavy storm. This caused the company considerable expense and delay. The mine is now in full work again. The lode looking very well in No. 3 level.

Zeehan Queen (late Silver Queen).—Under the management of Mr. T. Vincent, jun., the machinery has been put in thorough repair, new boilers and steel poppet-heads placed in position, and the work of unwatering the mine is now being proceeded with. When this is done arrangements will be made to start sinking.

Oonah.—The mine is still being carried on by parties of tributors.

Florence.—Manager was making good progress in opening up the mine when the flooding took place. A few weeks' pumping ought to see the water out again.

Western.—This mine, which held the premier position on the field for several years, has been re-floated, and is to start pumping immediately. It will be under the management of Mr. J. Craze, of the Montana.

New Mount Zeehan.—New Mount Zeehan has only a few small tribute parties at work.

Mount Read District.—Hercules Mine is opening up very well; abundance of ore in sight. An air-compressing plant has been erected during the year, and No. 5 adit is being put in by this means.

Mount Read.—This mine, which has been idle for several years, has again made a start. A deep-level adit has been started.

Fahl Ore Co.—The manager is still putting out small parcels of high-grade ore, which is purchased by the Mount Lyell Company.

Mount Farrell District.—North Mount Farrell Mine.—A good ore-dressing mill has been erected and started; it is giving satisfaction. Mine is opening up well. An adit has been put in to cut the lode at the same level as the mill. When a connection is made with the shallower workings, all the ore, both for the picking sheds and the dressing mill, will come that way, making a big reduction in cost of delivery.

Mount Farrell.—Mount Farrell mine manager has struck a large formation in the end of adit, showing thin veins of ore, which assay well. It is confidently expected that good ore will be obtained when the other wall of the lode formation is struck.

Mackintosh.—A good lode has been struck in the mine, and sunk on to a depth of about 40 feet, when the water got too heavy for the appliances. A chamber has been cut in the side of adit, and a small pumping and winding plant is being put in position. A rise to the surface will carry away all smoke and steam.

Murchison and Central.—Both these mines have resumed work, with favourable prospects, after being idle for some time. Indeed, the Mount Farrell district promises to add very considerably to the output of the Coast in the near future.

Waratah.—At the Bischoff Mine matters are going on as usual.

Magnet.—This mine maintains a good output of gossan and sulphide ore, last quarter's returns showing a net value of £8940 on ore won and sent away. Preparations are being made to sink a main shaft on the course of the lode, for which purpose a compressing plant is being provided.

Heemskirk District.—Mayne's.—The adit through the spur to turn the creek will soon be completed. When this is done good tin returns may be confidently looked forward to.

Connor's Tin Mine.—Several men at work raising tin, with good results.

Federation and *Montagu* are both under offer to good strong syndicates. There are numerous parties at work in the district, some of them doing well. Many of the leases on the side of the Mount are awaiting better weather before anything can be done. The Government has made several good pack tracks up the face to the Mount, and there is another under construction now, which will open up a lot of new country to the prospector.

Stanley River District.—Several parties have been at work on the Stanley tinfield, and some good shows have been opened up; but the Pieman River is the drawback. A suspension bridge will have to be erected before machinery can be got on to the ground

General.

In conclusion I may state that prospecting is going on in all directions, and all points to a brighter future for the Western District.

LIST of Accidents in Inspector Harrison's District for 12 *months*—30*th June*, 1902, *to* 30*th June*, 1903.

Date.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Remarks.
1902. 13 Sept.	Mount Zeehan (Tas.) S.L.	Zeehan	Fall of hammer	Arthur S. Mayne	Married	Wound on head	Helping to fix ladder in pass; man working about 20 feet above let hammer fall, and it struck Mayne on head.
20 July	Ditto	Ditto	Bucket fell out of cage	Michael A. Hoy	Ditto	Broken thigh	Was braceman. Through mistake in signals the engine-driver knocked empty bucket out of cage, and it fell on Hoy.
12 Nov.	Hercules G.S. and C.	Mt. Read	Fall of stone	Harry Hanson	Single	Both legs broken	Working in face of drive after shot; a piece of stone came away from face and struck him on the legs.
13 Nov.	Comet S.M.	Dundas	Jambed by truck	Chas. Lucas	Ditto	Bruised hand	Got his hand between the buffers of two trucks.
1903. 7 Mar.	Mount Zeehan (Tas.) S.L.	Zeehan	Thrown out of cage	Chas. Symmons	Married	Shock to system	Descending in cage; driver lost control of engine, and Symmons was thrown out.
26 Mar.	Comet S.M.	Dundas	Fall of truck	Jas. Daly	Single	Sprained ankle	Riding on a full truck; truck ran off rails and threw him off.

14 April	Tas. Smelting Co.	Zeehan	Explosion of powder	Edwd. Coleman	Married	Burns head and face	Preparing to bull a hole; in spitting the fuse about two pounds of powder, in a keg close by, became ignited.
„	Ditto	Ditto	Thrown off truck	Jas. Annear	Single	Cut on head	Were riding on an empty bullion truck, which was accidentally thrown off the line.
„	Ditto	Ditto	Ditto	Henry Cooley	Married	Bruised shoulder	
„	Ditto	Ditto	Ditto	Winston Triffett	Single	Bruised leg	
17 May	Magnet S.M.	Waratah	Fell while lifting timber	Jas. Herrick	Ditto	Injury to bowels	Lifting a mine prop in the bush, and fell; timber struck him in abdomen.
22 June	Florence S.M.	Zeehan	Flooding of mine	Thos. Kestles	Married	Smothered by mud	Working below when mine became flooded, and failed to escape.
25 „	Zeehan Montana	Ditto	Fall of rock	Wm. Wilson	Ditto	Injury to back	Working in stope, and while stooping was struck on back by a stone.

Totals—1 fatal; 12 non-fatal—13.

Mr. Inspector **Curtain** (stationed at Queenstown) reports :—

For the year ending the 30th of June, 1903, I have the honour to supply the following brief summary of the casualties, &c., that have taken place in my district for that period :—

(*a*) Mount Lyell Mining and Railway Company, Limited.—Iron Blow Workings, Gormanston : (1) William Garlick, labourer, widower, aged 43 years; had his ankle crushed and bone broken by a piece of spoil rolling down the face of No. 1 bench and jamming his foot against the skip he was filling. (2) Edward Johnson, labourer, single, aged 21 years; compound fracture of leg and ankle, caused in the No. 2A bench under similar circumstances, only the man's foot was pinned against the tramrails. (3) George Board, labourer, single, aged 42 years; small bone of leg broken and ankle dislocated, by being jammed between two pieces of overburden on the No. 2 bench. (4) Peter Thompson, labourer, married, aged 31 years; fracture of left collarbone, probably due to falling, and contusion to right of spine. Thompson was engaged doing special work on No. 4 bench (barring down) during the crib time, and noticing a quantity of ore coming away, endeavoured to save himself by scrambling down the face, but before getting clear was overtaken and knocked down. His injuries were not serious, as he left the ward within a week of his admission. (5) John Gillespie, labourer, single, aged about 47 years; paralysis of body and contused wounds of face and jaw. This was the only fatality that attended *mining work* during the year, Gillespie being injured by a rock falling from the eastern portion of the face of the No. 1 bench on the 23rd of June, and dying three days later. The Coroner's enquiry resulted in a verdict of death by accident. Reduction Works : Here on the 5th of July, 1902, an interior explosion of unknown gas took place at No. 5 furnace, severely injuring two men—(1) Leopold Burrows, potman, married, aged 25, (2) Walter Marsh, tapper, married, aged 26—and fatally injuring (3) Thomas Jukes, potman, widower, aged 60. An enquiry was held, but beyond the cause stated, nothing else could be advanced to assist the Jury, who returned a verdict of accidental death, there being no evidence of negligence on the part of any one. (*b*) North Mount Lyell Mining and Railway Company.—At the mine (1) Ernest Moore, miner, married, aged 36, was seriously injured on the 22nd of October, while "popping" boulders in the stopes of the No. 1 level. A large slab-shaped piece of ore, that had previously been shot down, fell on Moore, and producing concussion of the spine, resulted in paralysis of the body from the hips downwards, from which Moore is still suffering. (2) Thomas Chowley, trucker, single, aged 30 years, severely bruised on the left shoulder by a piece of country falling from the back of the No. 2 level. Timber was advanced with the ground opened, and after sounding the back, preparations by cleaning up, &c., were being made for another set (square), when the accident happened. Chowley recovered, and left for East Coast. Reduction Works, Crotty : (1) Stephen Hahn, slagwheeler, married, aged 41 years, and (2) James Dormer, potman, single, aged 21, were with others engaged clearing away a burst of matte when, by contact with water from the granulating drain, an explosion took place, seriously injuring Hahn and slightly Dormer. Both recovered. (3) Frank Gomez, tapper, single, aged 24, severe burns to foot. Gomez attributes his injuries to the carelessness of a fellow-workman in leaving an empty pot on his track, that caused him to fall, and the molten matte from the pot he was handling splashed into his boot, with the above result. He is still an inmate of the local hospital. (4) William Barnett, tapper, single, aged 25 years, severely burnt on back, buttocks, arms, and hands. Barnett, following the customary practice of walking backwards with a pot of matte, fell into another. Instantly realising his position, he jerked himself out again, which presence of mind saved his life. He is still an inmate of the local hospital, and making an excellent recovery. He attributes blame to no one. South Mount Lyell Mine, Gormanston.—(1) John Deegan, surface hand, single, aged 21, was engaged filling ore trucks, and while walking to his usual work, attempted to mount a loaded truck, and, falling on the line, sustained injuries to the lower part of his right leg. He made a complete recovery, and was solely blameable for the mishap, as instructions had been posted cautioning all against riding on the trucks. (2) Louis Churd, platman, single, aged 25 years. By the breaking of a strong arm, Churd fell on a piece of slab, having two wire nails protruding, that caused injuries to his left buttock. He made a speedy recovery, and resumed work in a fortnight. All these casualties can be ascribed to circumstances that were purely accidental.

Ropes and Cages.—These have received frequent inspection, and all that are at present in use are in good order.

Ventilation.—In the two principal mines this has been good, and at the time of suspending operations at the South Mount Lyell the manager was about completing a "100-feet" connection from the stopes with the shaft, that would materially benefit his future operations. At the Blocks Mine another 100 feet has been added to the depth of the shaft, which now totals 572 feet, but the manager refuses to make any further connection with the higher workings, or surface, either for the purposes of ventilation or safety.

Open-Cuts and Quarries.—The former continue to increase in size, and I am still of opinion that regulations of a more definite character are required in order to govern their future.

Breach of Regulations.—Proceedings were taken against Edward Charles Russell, who was in charge of the King River P.A.'s tribute party, for failing to cover abandoned shafts on that property. The charge was proved, and a fine of £2, with 10*s*. costs, was inflicted.

LIST *of Accidents in Inspector Curtain's District for Twelve Months, 30th June,* 1902, *to 30th June,* 1903.

Date.	Name of Mine.	Locality.	Cause of Accident.	Name of sufferer.	Married or single.	Nature of Injuries.	Remarks.
1902. 16 July	Mount Lyell M. & R.	Mt. Lyell	Falling rock	Wm. Garlick	Widower	Crushed and broken ankle	Stone rolled from face, and jammed his foot against skip.
22 Oct.	North Mt. Lyell	Ditto	Fall of stone	Ernest Moore	Married	Injury to spine, causing paralysis from hip down	Was popping boulders, which had been shot down from stopes; whilst boring a hole he was jammed by a boulder, which slipped and caught him about loins.
22 Dec.	Ditto	Ditto	Ditto	Thos. Chowley	Single	Bruised shoulder	Was trucking; a portion of the face came away, and jammed him.
1903. 8 Jan.	Ditto	Crotty	Scalded by molten matte	Stephen Hahn	Married	Severely burned	Hahn and Dormer were engaged at the smelters. Some matte escaped from the furnace, which the men proceeded to break up when considered sufficiently cool; the matte was not cool enough, and when the crust was broken began to run; some went into slag-drain, and caused an explosion.
"	Ditto	Ditto	Ditto	James Dormer	Single	Slightly burned	
17 Jan.	South Mt. Lyell	Mt. Lyell	Run over by truck	John Deegan	Ditto	Bruised knee, calf, and toes	Attempted to jump into truck in motion; his foot slipped, and wheel went over lower part of leg and foot.
24 Jan.	Mount Lyell M. & R.	Ditto	Fall of stone	R. Johnson	Ditto	Compound fracture of leg and ankle	Working on overburden bench; a piece of rock rolled about 4 feet, and

26 Jan.	Ditto	**Ditto**	Ditto	**George Board**	Ditto	**Small bone of leg broken, ankle dislocated**	**Working at overburden; a piece of rock rolled about 5 feet, and caught his leg.**
13 Jan.	Ditto	Ditto	Ditto	Peter Thompson	Married	Broken collarbone and bruised back	Barring down rock after a shot; some of it came away, and knocked him down.
23 June	Ditto	Ditto	Ditto	John Gillespie	Single	Injury to spine, face, and neck; causing death	Filling a waggon at open-cut; a stone came away from face, and struck him on the head. He was paralysed, and died on 19th July.
1902. 5 July	Ditto	Ditto	Explosion in furnace	Walter Marsh	Married	Severe burns	Employed at furnace of No. 1 plant; an unaccountable explosion took place, forcing out some of the molten matte on to the men. Jukes died on the 19th July.
"	Ditto	Ditto	Ditto	Leopold Burrows	Ditto	Ditto	
"	Ditto	Ditto	Ditto	Thos. Jukes	Widower	Burns; causing death	
1903. 1 Jan.	South Mt. Lyell	Ditto	Fall in drive	Louis Churd	Single	Wound in buttock	Placing truck in cage; strong arm broke, and he fell backwards on to a plank, from which two wire nails were sticking out.
13 Mar.	North Mt. Lyell	Crotty	Overflow of molten matte	Frank Gormez	Ditto	Right foot severely burned	Whilst moving a pot of molten matte he stumbled over an empty pot, which had been left in the way. Some matte splashed over on to his foot.
28 May	Ditto	Ditto	Fell into pot containing molten matte	Wm. Barnett	Ditto	Severe burns on back, hips, arms, and hands	While delivering a pot of molten matte he fell backwards into another which stood near.

Fatal, 2; Non-fatal, 14; Total, 16.

Mr. Inspector GRIFFIN (stationed at Gladstone) reports :—

I have the honour to submit my Annual Report on mines inspected in the Northern, Eastern, and North-Eastern Divisions, during the twelve months ending 30th June, 1903.

Accidents.—Fatal, 3; serious, 13; not serious, 4; total, 20.

Of the fatal accidents, William Dawson was killed whilst employed as nozzle man at the deep open-cut face of the Scotia Tin Mine, near Gladstone. After having undercut a prominent point with the hydrant, Dawson went close into the face, probably to examine the washdirt. His mate, working a little way down the tail-race, heard a thud and splash, and on looking up saw him lying on his back. A portion of the fallen mass of pug and cement, already on his feet, rolled forward on to his chest, and caused death from suffocation before assistance could be rendered. Deceased, who was for some considerable time engaged as manager of the mine, was known to be an experienced and careful man, never allowing those under his charge to run any risk. He evidently stepped backward, and his feet sticking in the soft bottom prevented him from escaping the falling mass of pug and cement. No blame is attachable to any person for this accident. Kooee Chung, a Chinaman, 70 years of age, was killed while working a miner's claim for tin at head of Black Creek, near Branxholm. He and a mate were ground-sluicing—picking down the face about 8 feet in height into the sluice-race. A large stump was being taken down, and in falling one of the long roots struck deceased in the chest and knocked him down. He was immediately covered with earth and smothered. Chinese as a rule are incautious, and take but little heed of any warnings given them. Edgar Shepherd, 17 years of age, was employed as wheeler or trucker at the Dulverton Colliery. The seam being worked is only 18 inches in thickness. The practice is to work this in four-yard bords on either side of the heading or truck-road, and without breaking the roof or floor. Thus the men have to work in a recumbent position, from which it is not easy to get clear of any sudden fall from the roof. Shepherd was in such a position, and, although well protected by the propped portion of the roof under which he was lying, he had to reach forward into the 5-feet passage, between the line of props and the coal rib, so as to shovel back the coal from his brother, Nat. Shepherd, an experienced miner, working in the face. The roof in the passage referred to was not considered to be unsafe, either by the manager or the man, Nat. Shepherd, working in that bord. The shaly clod was, however, inclined to flake; a large flat piece fell suddenly from the roof, the extreme edge striking deceased on the temple, and jamming his head against a prop. Death must have been instantaneous. This accident may be classed as unavoidable; yet there seems to be necessity for a regulation requiring daily inspection on the part of the manager, or other competent person, immediately before the men commence work on any shift in our coal mines.

Serious Accidents.—Thomas Crook was working down loose rock, portion of the hanging-wall in stope at Tasmania Gold Mine; a large lump rolled and caught his leg, bruising it badly. No bones broken; accident unavoidable.

Alfred Watkins was raking quartz into a pass at same mine, dropped his candle, went down the pass to recover it, and was struck on the head by a stone that fell from the collar of the pass; received a nasty cut and slight fracture of outer skull-bone. Accident due to his own carelessness.

Walter Ferrall was engaged shaft-making at the New Golden King Mine. Fixed a single plank for a stage in the shaft 15 feet above the bottom, and proceeded to replace some centres knocked out by blasting. His mate, John Mortimer, went to the level 20 feet above where he was standing, and attempted to lower a centre plank to him. It slipped from the rope, and striking the stage plank, knocked it away. Ferrall fell to the bottom of the shaft into 3 feet of water; sustained severe shaking and injury to his side, which incapacitated him for work for some time. Both manager and man were to blame in this case; Mortimer for not using a cage or bucket, and properly securing small timber therein before lowering. He pleaded ignorance of General Rule Subsection xxi. The manager had provided proper means for lowering timber in a shaft, but neglected to supply Mortimer with a copy of General Rules, in accordance with Subsection xliii. of the Act. It was not considered necessary to take any legal proceedings against the offenders; an all-round severe reprimand for carelessness was thought sufficient.

William Finch was trucking at the Tasmania Gold Mine. Truck went off the rails, tipped the footplank, and threw him with force on to the corner of the truck. He sustained three broken ribs. Accident unavoidable.

William Arnold walked into a heap of hot ashes at Tasmania Gold Mine, and received severe burns to one foot and leg. Was off work for a fortnight. Accident due to his own carelessness.

John Johnstone was working in No. 2 stope at Tasmania Gold Mine. The cap over which he was standing gave way owing to defective hitch in footwall, and he fell some few feet into the stope below, amongst loose stones, and broke his ankle. He has only himself to blame for the accident; the defective hitch was his own work, and he was more than once cautioned to be more careful.

Harry Cottereill was assisting to haul a long cap into position at the Tasmania Gold Mine. The rope broke, and he fell backwards and down about 3 feet, struck a tie piece, and broke his shoulderblade, but not badly. A better rope should have been provided for work of this kind.

Alfred Johns was screwing up glands of poles in pump shaft, Tasmania Gold Mine. He slipped, and fell 10 feet on to staging, sustained shock and bruises. No bones broken. The accident was unavoidable.

Lewis Fred Butten was filling quartz into a truck at schute (Tasmania Mine) when he was struck by a flying fragment of steel, the injury received resulting in the loss of one eye. No one to blame for accident.

James Lahner was spawling rock at the Mount Rex Tin Mine, when a fragment of stone from the hammer struck him, the accident resulting in loss of one eye.

John Quinn was trying to put a belt on to the pulley of battery cam-shaft at Anchor Tin Mine. He slipped, and fell 10 feet on to the next floor, striking his head in the fall against a beam. He was unconscious for some time. The doctor pronounced injuries to be concussion of the brain. A fortnight after the accident he appeared to be all right again.

Robert Thomas was packing a gland of hydraulic-power engine at the Tasmania Gold Mine when the gland slipped and caught his hand, severing the first joint of one finger, and breaking the bone of another.

Jeremiah Maher was engaged running off overburden at the Briseis Tin Mine. He was caught by a slip of earth from top of face, and forced over the side of a bank. Sustained a severe shock, and had one rib broken.

Of the not serious accidents, Joseph Allen, underground manager at the Tasmania Gold Mine, was struck on the head by a small stone while examining an empty pass.

William Simmons was engaged shaft-sinking at the Mount Rex Tin Mine. The bucket on being hauled to the surface struck an opening set passing a level, and some of its contents was tipped out, Simmons received some slight cuts on the head from the falling dirt.

Harry Wilson was raking quartz into a pass at the New Golden Gate Mine; a large lump of stone fell from the backs, rolled over against him, and jammed his foot.

Peter Crawford was moiling a hitch in stope at Tasmania Gold Mine; his mate's hammer slipped, striking him on the knee, and causing a slight injury.

Nine out of thirteen of the foregoing serious accidents, and two out of four of the non-serious, occurred at the Tasmania Gold Mine, Beaconsfield: a rather high percentage for one mine. Carelessness on the part of the men themselves is responsible for very many of the accidents that occur; this was particularly noticeable at this mine until recently; more strict supervision is now improving matters in this direction.

Observance of Rules and Regulations.—It cannot be said that there is much improvement in this direction, especially on the part of the miners themselves. It was hoped that the issuing of a copy of the General Rules to each miner upon being engaged, as provided by Sub-section XLIII. of the Act, would improve matters; but such is not the case. A large percentage of the accidents that happen are due to the carelessness or negligence of the men employed; of the balance, many of course are unavoidable; only a few are caused through the negligence of owners or managers. Of the three fatal accidents, two were caused by the incautiousness of the unfortunate men who were killed; the third might possibly have been averted under a better system of supervision in the working of thin seams in coal mines.

Defective Workings considered unsafe.—In one case, that of the Tasman Ophir Alluvial Gold Mine at Beaconsfield, it became necessary for the inspector to order a cessation of work and departure of the men from the lower level main drive, until certain alterations and improvements to the shaft and drives, and general equipment of the mine, so as to put it in a safe condition for men to work in, were carried out. This mine is owned by a Sydney company, and worked on freehold property. Several attempts have been made during the past 20 years to reach the wash, supposed to be very rich, at the deepest part about 400 feet from the surface. The shaft was first sunk to a depth of 300 feet, for the most part in the sandstone rock; the influx of water was heavy, and work was abandoned. The ground is now thoroughly drained by the neighbouring Tasmania Quartz Mine. A couple of years ago, the present Company re-opened it; the shaft was sunk to 400 feet in a sort of a way. One end was allowed to come in, so that when the lower level was reached the length was reduced by one-third. Attempts were made to drive through the western rim-rock, and tap the wash-dirt; but with only partial success. Several mine managers succeeded each other; and the inspector had on nearly every visit to deal with a fresh man, who promised to carry out the orders his predecessor failed to comply with. Disregard for the safety of the men employed was often shown; one lad had a narrow escape from being killed, and only saved his life by clinging to the signal-line after falling from the bucket that he and the manager were descending on. There was no hope of improvement, and I therefore ordered a cessation of work as above. The mine is now being worked in a satisfactory way under the management of Mr. J. F. Murphy.

Cages, Ropes and Chains.—These have been inspected and tested at regular intervals, and where found defective have been condemned. Not much to complain of in this direction, so far as the large mines are concerned, where weekly overhaul, cleaning and inspection is the rule. Some of the small mines, however, are not so good, and require more attention from the inspector.

Ventilation.—I am glad to report an improvement in this. The Tasmania Gold Mine which, from the extent of its workings and quantity of natural gas in the strata, requires a more perfect system of ventilation than perhaps any other mine in the State, has at last effected a great improvement. The two main working shafts have been connected by drives, and a rise put in from the 718-feet level in the main shaft to the Reidler pump chamber, at 600-feet level in Hart's shaft; other connections have also been made in the western portion of the mine. The boxed air-drift from the Florence shaft along the 600-feet level is nearly finished. This done, the Roots' blower obtained over a year ago will be started. I understand that this machine is now to be used as an exhaust-fan to draw the light air out of the mine; reversing it, and using it in the opposite direction for what it was designed, is not likely to improve its efficiency. A proper Walker exhaust-fan would give a much better result than the reversed blower; and the initial cost would not have been greater. At the New Golden Gate Mine much has also been done to improve the ventilation, in the way of rises, and a separate connection with surface at the south of main shaft.

Complaint made.—Only one complaint was formally made as provided by Section 97 of the Act. Two miners at the Mount Nicholas Colliery complained, in writing, of defective timbering in travelling way, ladder insecure, and water lying in parts of drive; also bad ventilation, gate-roads too low and insecure, main heading defective. The Chief Inspector of Mines, in my absence, visited the colliery, and made a thorough inspection and enquiry, with the result that, although not entirely groundless, the complaints made, for the most part, were considered unjustifiable. A dispute between manager and men as to work required to be done by the latter, as part of their contract, had, I think, a lot to do with the making of this complaint.

Outlying Mines.—The Barn Bluff Mine was visited an inspected in March; only six men were then employed. The new track from Gad's Hill to the mine, finished a year ago, shortens the route as compared with the Innes track by nearly half; the former being 24 miles the latter 46 miles. Another great advantage is that half the distance—12 miles—of this new track is up the valley of the Forth River, over good sound country, no hills to speak of, and below the ordinary snow-line; so that the traveller in the most inclement weather can find shelter from the hills both east and west. The Innes track, on the other hand, traverses the tops of dividing-ranges and high plateau country, over bleak open country, and apart from being double the distance, is only accessible for two or three months of the year; even then there is some risk of being driven back by sleet, or of being enveloped in fog. There is, of course, Gad's Hill to descend, and the hill west of the Forth to ascend, going out on the new track. The descent of Gad's Hill to the Forth River on the western side is made by a 5-feet side-cutting, in rich basaltic soil, the distance being about 3 miles through a heavily timbered country; gradients are not two steep for wheel traffic, but, of course, will require metalling for this. All the land in the vicinity has recently been selected for farming purposes. Ascending the hill on the west side of the Forth River is at present the most difficult part of the journey. Before this is reached, there is 12 miles of good travelling, in a southerly direction, up the east side of the River Forth; sound country, for the most part over sandstone, schist, and river shingles. Several large creeks come down from the east, all of which are bridged. For about 5 miles, the track lies close to the river, and there is good deal of side-cutting; the crossing is by means of a substantial low-level bridge, that from its position and construction is not likely to be damaged by floods. Having crossed the river to the western side, the track follows up-stream for two miles; some soft places occur, but the covering of peaty soil is only a couple of feet in depth, and overlying a sound bottom of river shingles, and schist. In constructing the track, many of these soft places have been got over by stripping off the peaty surface, and exposing the gravel, or the rock, as the case may be; this method ensures sound travelling, and, if rather wet in the channel track, is at least safer than having to struggle through mud and roots. Immediately after crossing the Commonwealth Creek, coming in from the west and junctioning with the Forth at this place, the ascent of a hill locally named "Razor-back" is commenced; the track is now zig-zaged for about 70 chains, the rise in this distance being something like 1700 feet. This is too steep for anything like the ordinary pack load; 1 in 2½ to 1 in 3 cannot be climbed without great exertion. It would not be very difficult nor expensive to reduce this zigzag to an easier gradient, by lengthening the leads. The rock, a white schist, is generally of a soft nature, and, as the country is only sparsely timbered, a moderate outlay would greatly improve the ascent of "Razor-back." Should this be done, there will then be a good practicable route over half the distance to be traversed between Liena on the Mersey, and the West Coast Mine; and a track for the reasons already stated, that will be accessible at any season of the year. Nearing the top of Razor-back, the track rounds some steep cliffs, south of Commonwealth Creek; thence, for another mile, following up the creek to the Barn Bluff Mine. The camp is situated on a spur, between the Commonwealth and its confluent, Cooks' Creek, and is about 4 miles south-east of Barn Bluff mountain; it is aproximately 3300 feet above sea-level; west of the camp, the hill still rises, and another 500 feet has to be climbed to reach the plateau and Lake McRae. The latter is only one mile distant from the mine, and from this source a good supply of water for motive-power is obtained.

Mining Operations.—A good deal has been done in the way of open-cut and shallow pit prospecting, the principal mining work is, however, by means of tunnelling; there are three of these,—No. 1 is centrally situated between the other two, and has a bearing for the first 255 feet of 225°, thence for 92 feet at right angles to this first section the bearing being north-west. The mineral belt passed through is composed of quartz, schists, fluorspar, micaceous iron, and actinolite carrying copper and iron pyrites. No. 2 tunnel, about 100 feet to the north-west of No. 1, is in 96 feet, on a course parallel to the first part of No. 1. It has been driven for the most part through solid lode matter containing copper-pyrites, and is following what appears to be a fairly well defined wall; no work was being done in this tunnel at the time of my visit. No. 3 tunnel is on the south-west side of the spur, and close to the big band of chlorite schist that forms the south-west boundary of the mineral formation; it was driven only 20 feet and abandoned. Work is now confined to No. 1 tunnel, which has cut what is said to be the lode formation driven on in No. 2; it is intended to follow this, on its south-west course, until its junction with the band of chlorite schist is reached, when good results are expected. The machinery comprises a Little Giant Air-compressor, and machine drills, operated by a 24-inch Pelton-wheel, and working to a pressure of 60 lbs. The water supply is obtained from Lake McRae by means—for the first mile—of an open channel, terminating on the cliffs immediately above the mine. From this point it is conveyed to the mine through about 700 feet of 6-inch black riveted-iron piping; the "head pressure," being equal to nearly 500 feet; the efficiency obtained from this is not, however, as good as it ought to be: the defect is probably owing to the machinery not being properly set up. There is a lot of friction that should not exist. Altogether the Company have expended a lot of money, and have had many difficulties to over-come, especially in the early stages and before the new track was opened. Supplies could only be obtained at irregular intervals, owing to the roundabout and almost impassable state of the Innes' track; even now, the cost of packing from Liena—24 miles, is for food supplies 1½*d.* per lb.; and for explosives, and other mining requisites, 3*d.* per lb. Miners are paid 10*s.* per shift; there are now only 6 men, including the manager, on the mine.

Middlesex.—There was no work going on at the Devon Mine, nor at Shepherd and Murphys', in March; I therefore did not visit these mines.

Coal Mines.—The two large Collieries.—Mount Nicholas and the Cornwall, have been inspected at regular intervals; at the Mount Nicholas Colliery, work has been going on steadily throughout the year, and I am glad to report an improvement in the working of this mine, especially with regard to ventilation. The return airway has been straightened, and made higher in places, the furnance at upcast shaft bricked in, and more attention generally is given to matters concerning the safety of the men employed.

At the Cornwall Mine, work was stopped for several months, owing to the men coming out on strike, and demanding an all-round increase in the contract price for hewing, when at one or two places only did the hardness of the coal justify such a demand. The Company refused to be coerced into compliance with the demand and shut down the colliery until at last they were enabled to obtain non-union labour, many of the old hands abandoning the union and returning to the colliery to work under non-union rules. The Company was forced to abandon its contract to supply coal to the Melbourne Harbour Trust; the loss sustained in this way is—they maintain—more than compensated for by being able to work their colliery by non-union labour. The working of this colliery with regard to the safety of the men employed was satisfactory.

Mersey Coal Mines.—Spreyton Mine. Mr. Allison, the proprietor, has 7 men working an 18-inch seam from a low tunnel extended about 140 yards into the hill. The conditions under which these men work with regard to height, space, and dryness, are not nice. The main tunnel is only 4 feet in height, gate-roads are even less than this, just sufficient to allow of the skips being run in. Each bord, 8 yards wide, opening off these gate-roads, has a passage for the skip down the centre, the roof being cut to obtain sufficient height for this; the 18-inch coal-seam is worked on either side, without cutting either roof or floor, the men working in a recumbent position, from which it is not easy to escape accident should a fall of roof occur. Stowing the goafs or worked out spaces with *debris* from the road brushings, also supporting the roof with timber props as the work proceeds, is carefully attended to; drainage was defective, causing a muddy state of roads and working places; this was ordered to be remedied, also repairs to tunnel timbers. The coal is worth 12*s.* per ton delivered at the rail station, three miles distant.

Dulverton Colliery, some 5 or 6 miles further south, is also an 18-inch seam; and worked under similar conditions to Spreyton, the roof and floor being somewhat harder, and drainage better. Only three or four men are employed in the summer time, more hands being put on in winter, when there is a better demand for coal. It was at this mine that the lad Edgar Shepherd, already referred to in the fatal accident list, met his death. It is quite likely that he would have escaped had there been more room between the roof and floor. A regulation, making it incumbent on the manager, or some competent person authorised by him, to carefully inspect the mine of which he has charge, immediately before the commencement of shift, is required. The usual practice in Coal mining is to work on day shift only, the mine is therefore standing for 16 hours out of every 24 and, apart from the state of the ventilation, the roof and sides may have became unsafe during the interval. This matter will receive attention in new regulations proposed to be introduced.

York Plains and Colebrook.—I inspected these collieries in November, 1902, and again in June last 1903. On each visit I found but little doing at Colebrook, the Marialva Company is slow in developing its mine; several changes have been made; the mode of working and equipment is not althgether satisfactory. The Glenleith mine, close by, is owned and worked by Mr. Andrew Morrison, whom I found was away at Hobart for a few days. The shaft from which the coal is landed is 64-feet in depth, and worked by a horse-whim. There is a second shaft close by this, which serves as a travelling way for the owner and the one man he employes to assist him in working below, the ladder by which they descend and ascend is a single pole with short pieces nailed across, a dangerous contrivance; everything about the mine was in a defective state, and not safe to be used. I had therefore to order the cessation of work below ground until renewals and repairs ordered are effected, and the mine put in a safe working condition. At York Plains, some few men—five or six at most, are getting coal by means of tunnelling into a hill. The seam is worked to the dip, a new tunnel being opened when a certain distance is reached, and the haulage in the old one becomes expensive. Contractors for coal getting are as a rule not too careful in securing the ground they work, a fall of roof in this mine, just before I visited it in June, points to something like wilful neglect on the part of the men employed. The owner, Mr. A. H. Warner, who resides in Hobart, tells me that he has had a lot of trouble in getting the men, who are all working tonnage rate for coal getting, to work the mine properly. This state of things is likely to last so long as the man he employs as manager is also one of the contract party. It will be necessary for me to visit these small coal mines at the usual quarterly rounds in future; twice a year is not often enough to inspect where such loose methods of mining are practised.

New Regulations required.—Now that the principal mines—Mt. Nicholas and the Cornwall—have extensive workings, extending into the hill for nearly a mile in places, and with an increasing depth of the overlying stratas, it becomes a question of whether it would not be prudent to introduce fresh enactments, requiring the owners of these and other similar mines that may be developed hereafter, to provide a means of testing for the presence of firedamp in any mine over a certain specified depth from the surface, and extent of area worked; also, to provide and keep on the mine a certain number of safety-lamps of an approved make, to be used in case of emergency, should such arise. Inspection of the mine and all working places before the men enter at commencement of a shift, should also be required. During a visit to the coal-fields of New South Wales, Newcastle, Wollongong, and Lithgow, made in September, 1902, I had an opportunity of gaining a lot of useful information with regard to the means employed for detecting the presence of firedamp (light carburetted hydrogen) in the mines; also other matters concerning the management and working of coal mines; and of hearing the theories advanced by experts and others as to the cause of the terrible disaster, by which 93 men and boys lost their lives in the Mount Kembla Colliery, on the 31st of July, 1902. The presence of from 5 to 13 per cent. of carburetted hydrogen, mixed with the ordinary atmosphere, when brought in contact with a naked light, is sufficient to cause an explosion. The ordinary safety-lamps used by miners in fiery mines will only detect firedamp when the quantity reaches two per cent or upwards. Tests made in this way, with the ordinary lamps, have, in most instances, and for a great number of years, been considered as a sufficient precaution against explosions of firedamp. It has been discovered of late years, however, that a small percentage of this gas mixed with coal-dust will, if ignited, cause an explosion. Some authorities say that 1 to 1½ per cent. is sufficient. To detect the presence of this low percentage, hydrogen gas in a specially-constructed lamp is used; by this means one-quarter per cent of firedamp can be detected. These lamps give a dull, red light, and are only used for the purpose of inspection, and to detect the low percentage that the ordinary working lamp would not show. Explosions have been known to occur in mines where firedamp had never been detected. This was so in the Cammerton Mine, England, which has been worked for 100 years; yet an explosion occurred, and killed several men. Firedamp was known to exist in the Kembla Colliery many years ago, when a man, cutting through an old goaf, was badly burned; no explosion occurred then, as the gas was only in the inflammable stage. For many years prior to the late disaster no firedamp was discovered in the mine. Coal-dust had accumulated in appreciable quantities in dry parts of the mine; a sample of this obtained by the Chief Inspector of Coal Mines, Mr. Atkinson, and sent to Woolwich to be tested, was pronounced to be violently explosive; but as no gas had been officially reported by the inspectors, and as he, the Chief Inspector, had not discovered any when he inspected the mine a few months before the disaster, it was not considered necessary to suggest the use of safety-lamps. From expert evidence given at the inquest, mainly that of Mr. A. Atkinson, Chief Inspector of Coal Mines, the following deductions may be arrived at :—1. That coal-dust and one (1) per cent. of firedamp, with a naked light, are dangerous; but the dust must be in a cloud, and those conditions do not ordinarily exist in a mine. That an accumulation of this gas in the goafs or unstowed portions of old workings in a coal mine, or in working-places left unworked for several days, may be suddenly dispelled by a fall of roof, carrying along with it coal-dust in sufficient quantity (1 lb. to 160 cubic feet of air and 1 per cent. of gas) to cause an explosion when brought in contact with a naked light. 2. That in a naturally wet mine, or in a mine where the roads and working places are frequently watered to keep down coal-dust, there is not much danger of explosion until the firedamp, should there be any, reaches 5 per cent. This percentage, mixed with air, will, if brought in contact with flame, explode without coal-dust being present. Following a suggestion of our Chief Inspector of Mines, Mr. W. H. Twelvetrees, I made inquiry whether firedamp in New South Wales is confined to the Permian Coal Measures (= our Mersey field), or has been observed in Mesozoic Coal (= our Mt. Nicholas). The coal mines of New South Wales are mainly in the Permo-Carboniferous measures, and are all more or less "fiery;" especially so in the "Bulli" seam, where 13,800 cubic feet of inflammable gas was known to have accumulated in eight hours.

With reference to precautions necessary to be taken, the advice given by inspectors, colliery managers, and other competent persons is, "Make inspection before the shift-work commences compulsory in all coal mines; such inspection, so far as the large mines worked below a certain depth are concerned, to be made with an ordinary working safety-lamp, of the most approved up-to-date make. Inspection of "wastes, unstowed goafs," and other vacant and abandoned places, to be made periodically; a hydrogen lamp for detecting small quantities of firedamp to be used if found necessary, or in very dry mines where coal-dust accumulates."

After having conferred with Mr. Twelvetrees, Chief Inspector of Mines, on the foregoing, I have now the honour to recommend that regulations, drafts of which are appended hereto, be made law.

No one can be brought face-to-face with, or view the disastrous results of such an explosion as wrecked the vast workings of the Mt. Kembla Colliery, causing appalling loss of life, without being deeply impressed with the necessity for taking, with regard to the working of coal mines, every possible precaution to avert a similar occurrence.

Tin Mines.—The Mount Rex has finished blocking out stone at the No. 2 level, and made ready for stoping above this. Some fairly good stone was obtained from the north end at this level, the extent of which is not yet known. The main shaft has been sunk 91 feet, and made ready to open out, and crosscut for the ore-body at this, No. 3 level. The new dam is finished, and it is estimated that this will give water sufficient for driving, if required, double the number of stamps now in use.

The South Esk Company is opening up a very promising tin-lode on its property, and is still getting fairly good returns from the alluvial.

Anchor Tin Mine has a good water-supply, sufficient to keep the full battery running for the greater part of the year.

Australian Tin Mine : Not doing much. The prospects of this mine warrant a larger expenditure for development than the company are apparently prepared to put into it.

Star of Peace (Upper Cascade), finished the erection of its machinery in February. The plant, which is from the Gates Co. of Engineers, America, comprises a 10-head battery, stone-crusher and elevator, buddles, jigs, and frue vanners, driven by steam power. 3268 tons of stone crushed to 30th June gave a return of 21 tons of tin-ore. The stone is taken from open-cut, on a formation similar to the Anchor Mine, but is close to the contact of slate and granite; a belt of the former rock coming in from the Mount Victoria side. The company has had many difficulties to contend against in opening up the mine and erecting machinery. The outlet for the mine-products is to Ringarooma, a distance of eight miles, over one of the worst bush-roads on the East Coast.

Arba Tin Mine finished its drainage-tunnel to carry off the overflow from the haulage bins; removed the barge and sand-pump closer to the face and commenced elevating and sluicing in September, 1902, since which time 126¼ tons of tin-ore has been obtained. The drift is lifted a total vertical height of 144 feet, viz., 34 feet by the sand-pump into the bins, thence to the surface, 110 feet, by means of tanks on an inclined tramway. About 34 men are employed, including woodcutters. The depth of the ground worked is from 130 to 140 feet. This mine is worked in a systematic and intelligent way by the manager, Mr. G. J. Bondry.

The Briseis Mines have taken over the working of the New Brothers Home No. 1, by an arrangement with that company, and extensive operations in the way of removing overburden are now going on, this exceptionally wet season giving an abundant supply of water.

Pioneer Tin Mine.—315,900 cubic yards of drift have been pumped and sluiced during the year, for a yield of 392¼ tons of stream-tin, and dividends declared amounting to £23,250, equal to 18*s*. 6*d*. per share. The ground is now worked in two benches; the upper bench drift is sluiced direct to the sump of the large pumping plant, while the smaller pumping plant, situated at the lower or gutter-level, raises the bottom drift to the sluicing-level of the larger plant, which then handles the material, water and sand from both faces, and lifts it into the main sluice-race, the combined lift of both plants being 115 feet, of which the larger plant is lifting 80 feet, and pumping, latterly, 6000 gallons per minute.

A large dam is being constructed on Bradshaw's Creek, about 1¼ miles above the mine. It is now intended to stack the tailings in the worked-out ground, and to enable this to be done, another large centrifugal pumping plant (similar to the present one, but rather more powerful) is ordered, and its erection will shortly be commenced.

Scotia Tin Mine (North Mt. Cameron).—The proprietor, Mr. James Gulloway, has just completed the construction of tunnel tail-race, 17 chains in length, which will greatly facilitate the working of the mine. The open-cut face is 55 feet in depth, carrying tin more or less from the surface downwards; the bottom stope of 5 feet of wash being exceptionally good.

In the vicinity of Moorina, the old mines are maintaining fairly good outputs of tin.

Messrs. Thomas and Houston have taken up ground south of the old Frome workings, on which they have about 12 men employed.

The Weldborough Tin Mining Company is extending its main rock-tunnel through into the wash-dirt, to be worked in open-cut.

The exceptionally wet autumn and winter experienced has given a good supply of water to the smaller shows depending on storm-water for their supply, and a good many men are employed in consequence.

REGULATIONS FOR COAL MINES.

Inspection before work commences.—A competent person or persons, appointed by the owner or manager for the purpose, not being contractors for getting mineral in the mine, shall, within such time immediately before the commencement of each shift, as shall be fixed by special rules made under this Act, inspect every part of the mine in which workmen are to work or pass during that shift, and shall ascertain the condition thereof so far as the ventilation, roof, sides, and general safety are concerned. No workman shall pass into the mine or into the part so examined until these have been stated by such competent person to be safe. In every mine worked at a greater depth than 100 feet below the surface, and having an area of worked-out ground, goafs, or waste spaces of over two acres in extent, an inspection, in addition to the one before work as aforesaid, shall be made once in every week with a locked safety-lamp; and such weekly inspection shall include all wastes, goafs, and old or abandoned workings within the ventilating district inspected.

A report specifying the condition of the ventilation and the defects, if any, in roof or sides, and whether noxious or inflammable gas has been discovered during such inspection, shall be recorded, without delay, in a book to be kept at the mine for the purpose, and accessible to the workmen; and such report shall be signed by, and so far as the same does not consist of printed matter, shall be in the hand-writing of the person who made the inspection.

For the purpose of the foregoing provisions of this Regulation, so far as daily inspection is concerned, two or more shifts succeeding one another without an interval may be deemed to be one shift.

Discovery of inflammable gas to be reported to Inspector.—If at any time the discovery is made that inflammable gas exists in a mine, it shall be the duty of the manager, or in his absence, of the person in charge, to report such discovery forthwith to the Inspector of Mines for the district, who, after inspecting the place, if he considers the quantity of gas so discovered sufficient to render the use of naked lights dangerous, may, after having reported the same to the Minister, and obtained his consent thereto, order the use of safety-lamps in such place.

Safety-lamps to be kept on a mine where inflammable gas is known to exist.—Every owner of a coal mine shall, upon a discovery of firedamp or inflammable gas being made in his mine, provide and keep in good order and ready for immediate use, as many safety-lamps as may be required by men working in any part of the mine in which the use of naked lights may be considered dangerous by the inspector, or if, by reason of the small quantity of gas discovered, the inspector should consider the use of safety-lamps to be unnecessary in the working of such mine, they shall then be provided and kept as aforesaid in case of emergency.

Date.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of injuries.	Remarks.
1902. 12 Aug.	Tasmania G.M.	Beaconsfield	Fall of rock	Thomas Crooks	Married	Bruised leg	Taking down portion of hanging wal ; large piece came away and caught his leg.
10 Sept.	Ditto	Ditto	Falling stone	Joseph Allen	Ditto	Cut on right temple	Inspecting stope recently filled with mullock ; struck by stone falling down pass.
30 Sept.	New Golden Gate	Mathinna	Fall of stone	Harry Wilson	Ditto	Injuries to foot and head	Removing quartz from stopes; large stone fell from back of stopes and rolled against him.
29 Sept.	Mt. Rex T.M.	Ben Lomond	Ditto	Wm. Simmons	Single	Injured head	Sinking main shaft ; a bucket full of stone, on being hauled up, struck cap piece at No. 2 level and some stone was knocked out, falling on him
14 Oct.	Tasmania G.M.	Beaconsfield	Ditto	Alfred Watkins	Ditto	Ditto	Stone fell from pass and struck him on head, fracturing outer bone.
25 Oct.	New Golden King	Mathinna	Fall of timber	Walter Ferrall	Ditto	Bruised left side	Assisting to sink shaft, and standing on a plank about 15 feet from the bottom a piece of timber, which was being lowered from about 20 feet above, slipped out of sling, struck plank, and carried it away
30 Nov.	Tasmania G.M.	Beaconsfield	Fall on truck	Wm. Finch	Married	Three broken ribs	Trucking clay ; truck came off rails and struck plank on which he stood, throwing him on to the corner of the truck.
15 Nov.	Ditto	Ditto	Stepped into hot ashes	Wm. Arnold	Single	Foot and leg burned	Stepped into a heap of hot ashes.
15 Dec.	Ditto	Ditto	Fall in stope	John Johnston	Ditto	Broken ankle	Working in stope ; timber on which he stood gave way,

							fell 18 feet.
26 Jan.	Ditto	Ditto	Ditto	Alfred Johns	Ditto	Bruised and shaken	Screwing up glands; slipped and fell about 10 feet on to clack staging.
17 Feb.	Scotia T.M.	Gladstone	Fall of earth	Wm. Dawson	Single	Crushed to death	Sluicing down face; went forward to examine wash, and was caught by a fall of earth.
9 Feb.	Tasmania G.M.	Beaconsfield	Struck by splinter of steel	Fredk. Batten	Married	Injury to eye	Filling truck with quartz at a chute; a splinter of steel flew from the truck and penetrated his eye, causing its loss.
5 Mar.	Anchor T M.	Lottah	Fall in battery house	John Quinn	Single	Concussion of brain	Trying to put belt on cam shaft; he slipped, and fell 11 feet, his head striking a hand-rail in the fall.
30 Mar.	Tasmania G.M.	Beaconsfield	Struck by hammer	Peter Crawford	Married	Bruised knee	Moiling a hitch; his mate's hammer slipped, and struck his knee.
4 April	Ditto	Ditto	Machinery	Robert Thomas	Ditto	Injury to hand	Packing gland of ram in hydraulic power engine; gland slipped, and took top off one finger and broke a second.
21 Feb.	Mt. Rex T.M.	Ben Lomond	Struck by flying rock	James Lahner	Single	Blow on eye	Spalling rock, and a splinter struck him on eye, causing its loss.
25 April	Miner's Claim	Branxholm	Fall of earth and stump	Koee Chung	Ditto	Chest and body crushed, causing death	Working in tail-race which ran close to, and parallel with, a face; a fall of earth and stump came away from face and caught him, crushing him to death.
5 May	Dulverton Colliery	Dulverton	Fall of clod	Edgar J. Shepherd	Ditto	Head crushed	Portion of roof fell, and jammed his head against prop, causing death.
22 Jan.	Briseis T.M.	Derby	Fall over bank	Jeremiah Maher	Ditto	Broken rib	Removing overburden; a slip occurred, and forced him over bank.

Totals, 3 fatal; 17 non-fatal—20.

REPORTS OF THE COMMISSIONERS.

Mr. Commissioner O'Reilly (stationed at Scottsdale) reports:—

I have the honour to submit my Report for the year ending 30th June, 1903, upon the state of mining in the North-Eastern Mining District.

Gold.

There has not been any material improvement in the State of gold-mining in the Mount Victoria locality since my last state of gold-mining in the Mount Victoria locality since my last Annual Report, operations being carried on by small co-operative parties of miners, and confined to shallow lode-mining, and also prospecting. The gold won from crushings amounted to 521 ounces; and from alluvial mining, 24 ounces. Reefs of good average richness are known to exist upon several of the claims, but the want of capital causes the industry here to languish. I do not look forward to any marked improvement in the prospects of this place until sufficient capital is provided to test these reefs at a good depth.

At Warrentinna nothing worth noting has been done during the past year.

In the vicinity of Gladstone about 90 ounces of gold were won from the Brisbane Company's mine, formerly called the Portland; but this mine has been closed down.

There are several parties carrying on prospecting operations for gold reefs at Waterhouse and vicinity, with very satisfactory results, and a few sections have been applied for. The quartz lodes found here are of such richness as to warrant sufficient capital being provided to test them at a good depth.

Tin.

In the Ringarooma, Maurice, and Upper Cascade localities satisfactory progress has been made during the past year.

The Star of Peace Company has erected a 10-head battery in its mine at Upper Cascade, which is in full work crushing the lode-stuff for tin ore. The workings consist of an open cutting, about 30 feet in width and 25 feet in depth. The manager estimates that it will take four months to carry the cutting up to the main shaft in which the lode was found. This mine looks fairly well. About 30 men are employed.

At the Maurice River the Red Banks Company is opening up its mine by hydraulic pressure, and prospects appear promising.

There are six leases being mined in the above localities, about 50 miners in the aggregate being employed upon them. There are also 17 miners' claims held, upon which 26 European and two chinese are carrying on mining operations.

In the vicinity of Branxholm, the Arba Tin Mining Company has made satisfactory progress in the development of its mine, the yields on the whole being very good. About 40 men are employed in connection with the mine.

The several leases held by the Chinese at Ruby Flat continue to produce highly remunerative yields of tin ore. A new mine, named "The Contact," is being opened here by a syndicate, the prospects of which are considered very encouraging.

At Derby, the Briseis Tin Mines, Limited, having, since the completion of its new Ringarooma and Maurice water-race, an abundant supply of water for hydraulic purposes, has made considerable progress in the removal of the heavy overburden that has to be contended with before the tin drifts can be reached. A large quantity of the tailings are dumped in the river flats on its lease. Satisfactory progress has been made in the carrying out of the necessary mining operations upon this claim. About 417 tons of tin ore have been won during the past year. Considering the large quantity of overburden that has been removed during this period, this work being carried on simultaneously with the treating of the tin drifts, this yield may be looked upon as very satisfactory. The number of men employed in the mine averaged about 111. The New Brothers' Home No. 1 Company has, I understand, entered into an arrangement with the Briseis Company, under which the latter company will mine the adjoining lease held by the former company, having an abundant supply of water for the purpose. It is considered that this arrangement will prove beneficial to each of the parties to the agreement.

The Ringarooma Tin Mining Company is, I am informed, making arrangements for the erection of a more powerful plant upon its mine, so that a very much enlarged quantity of stuff can be treated. Mining operations will be suspended for a few months, until the new machinery will be erected, when mining operations will be carried on on a more enlarged scale in developing the deep lead of tin ore that intersects their lease. About 50 tons of tin-ore have been mined by this company during the past year.

The several small claims in the locality of Moorina, Weld and Frome rivers, have returned very profitable yields, and their appearance indicates that this will continue for a considerable time.

The Pioneer Tin Mining Company's Mine at Bradshaw's Creek maintains large outputs of tin-ore. The work at the mine is carried on under very able and careful management. During the past year 315,900 cubic yards of drift have been pumped and sluiced, for a yield of 392½ tons of stream-tin, and 18*s*. 6*d*. per share (equalling £23,250) declared in dividends. Since the inception of sluicing by the present company, 687 tons of stream-tin have been won, and £28,125 (equalling 22*s*. 6*d*. per share) have been paid in dividends. A large dam is being constructed in Bradshaw's Creek to provide an additional supply of water from that source for the mine. It is proposed shortly to stack the tailings in the worked-out ground. Another large pumping plant similar to the present one has been ordered, and its erection on the mine will shortly be commenced. A further series of bore-holes has been sunk between those put down some years ago, and proved the average depth and tin contents of the lead to be greater than was first estimated. The present position and future prospects of this mine are excellent.

At Wyniford River there are several small claims being mined with profitable results. The Garibaldi T.M. Co. obtained 32 tons of tin ore from its old claims.

In the South Mount Cameron district a number of miners' claims have been worked, principally by Chinese, and have yielded about 28 tons tin ore.

The preparatory work at the Scotia Tin Mine deep lead, situate near Gladstone, and owned by Mr. Galloway, is now completed, and mining operations will in future be carried on extensively. The prospects of this mine appear very satisfactory, and its proprietor is deserving of every success in his enterprising and costly undertaking in the opening up of this mine. In future large yields may be looked for.

There are several small claims being mined at Boobyalla River and vicinity, with but poor results.

Prospecting operations by means of boring-rods are being carried on at Bradshaw's Creek and its vicinity, testing the ground for a continuation of the Pioneer Company's deep lead. In other parts of the district a large amount of prospecting work is being done, which will probably lead to a considerable area of land being applied for to lease for mining purposes. During the autumn and early winter months there has been an unusually heavy rainfall, which has afforded an abundant supply of water for mining purposes, and has enabled a considerable extent of land to be mined that in previous years remained unworked through deficient water supply.

There is an increase in the quantity of tin ore won during the year ending 30th June, 1903, as compared with a similar period ending 30th June, 1902, of 443 tons 10 cwts., the quantity raised during the former period being 1379 tons 16 cwts., and the latter being 963 tons 16 cwts. As compared with the quantity raised during the year ending 30th June, 1901, being 683 tons 4 cwts., there is an increase of 696 tons 12 cwts.

With a continuation of a plentiful supply of water during the coming year, I look forward to a large increase in the output for that period.

It is gratifying to observe that the tin-mining industry in this district appears to be in a healthy and progressive state. A considerable amount of capital has been judiciously expended in *boná-fide* mining operations and works, in the development of deep leads of alluvial tin ore, and profitable returns may reasonably be looked for. On the whole, the prospects of the tin-mining industry appear brighter and more enduring than they have done for many years previously.

Mr. Commissioner FOWELL (stationed at St. Helens) reports :—

I have the honour to submit my Report for the year ending 30th June, 1903, upon the mining industry in the Eastern Mining District.

GOLD.

Mathinna and vicinity.—The mining industry in this portion of the district appears to be in a thoroughly healthy condition.

The New Golden Gate.—The mine has been working for the past 15½ years, and during that period gold to the value of over £700,000 has been won. This has been obtained from reefs varying from 3 to 30 feet wide and up to about 300 feet in length, from the surface down to the 1500-feet level. At present very little is being done at this level. These reefs have been cut off at a point south by a slide. Up to a few months ago the company had only been working on stone north of this slide, but lately, in prospecting south of the slide, at the 500-feet level, the continuation of the reef has been discovered. A distance of from 60 to 70 feet has been driven on the reef. It has proved to be from 17 to 20 feet in width, at present, in face, being 20 feet wide, the assay of the stone being 1¼ oz. The mine manager is now cross-cutting for the reef at the 316-feet, 600-feet, and 700-feet levels, and hopes within a few months to open up the reef at these levels. The value of this discovery cannot be estimated, but in all probability it means a big renewal of life to the mine.

The Volunteer Consolidated.—On this mine, at a depth of 450 feet, some good stone has been obtained. When I visited it, on the 17th of July last, 50 tons of stone had just been delivered to the Volunteer battery. There are three or four gold-bearing reefs on this property. All have been proved to be so, but not to a sufficient depth—I can only conclude, for want of capital. The prospects seem certainly to warrant a thorough trial, which the present company seem prepared to give. At 450 feet good stone has been found, and at that level the manager is driving to strike the intersection of two other reefs, which are known to carry gold. Should the stone at that depth prove payable, a long life to the mine is more than probable.

The Volunteer.—This company is also going down on its lode, with encouraging results. It has added to its battery, and has a good supply of stone to treat by it.

The Tasmanian Consols, late North Golden Gate, has opened up at 1200 feet, and driven 46 feet west, where it struck a continuation of the New Golden Gate ore-body with an average width of payable stone 4 feet. About 90 tons of stone have been raised, and will shortly be crushed at the New Golden Gate battery.

The Yellow Boy Company.—This claim is situated close to the Volunteer Consolidated. A tunnel has been driven between and 300 feet, and a trial crushing of 90 tons gave satisfactory results.

The Golden Stairs.—A company is being formed to develop this claim; the prospects are good, and work would have commenced now if the scare in Launceston had not occurred.

The New Golden King is opening up fairly well, and the company will soon be able to reap the advantage of crushing at its own battery.

Mangana and vicinity.—For some months nothing has been done at the mines in this neighbourhood. I am informed that at the *Mangana Reefs* work will shortly be resumed. The great drawback to progress in this portion of the district is the fact of so much of the land being private property.

Abbotsford Creek.—This property is situated near Tullochgorum. Work is being pushed along vigorously. A battery of 30 head of stampers is being erected, also a water-race constructed, and at the same time development of the ore-body is proceeding.

TIN.

Avoca and vicinity.—Mount Rex Mine.—This mine was first worked by a New Zealand company, for silver-bearing galena. After a few years the silver and lead gave place to tin, in the form of cassiterite, some copper, iron pyrites, zinc-blende, and a little galena. The company took out 3000 tons of stone or ore, from which they obtained 170 tons of tin oxide (metallic tin at that time being only £60 per ton). They then practically abandoned working the property, and leased it to tributors, who in turn took out 1180 tons of ore, obtaining 81 tons of tin oxide. After this the property was floated as a public company, for 100,000 shares, but only 5000 were put into working capital, and this materially crippled the advantageous working of the mine. After disposing of a certain quantity of tin ore (concentrates), obtained from the 20-head battery installed by the new company, the purchasers in the Australian market refused to take any further lots, on account of its complex composition. The company then sent 50 tons to England, which netted them £54 per ton. This was in 1902, and since then there has been no difficulty in selling all the ore produced. During the past year, ending 30th June, 1903, the mine has been steadily developed. The necessary dead work that should have been taken in hand previously has been commenced. When the present manager took charge, in August, 1902, the development consisted of an adit level, driven in from the surface 40 feet below the outcrop, and a shaft sunk to a depth of 140 feet, from which a crosscut was driven to cut the ore-body. This met the ore 52 feet from the shaft, and, the level being opened up, has since proved the body of tin-bearing stone to be 78 feet wide and 100 feet long, still extending in a north-westerly direction. It is from these two levels that all the stone sent to the battery by the present company has been obtained. Since August last 4700 tons of stone have been supplied to the battery, the shaft has been further sunk 100 feet, and a crosscut 150 feet in length has been driven, proving the ore-body at this level (No. 2) 240 feet in depth to be 72 feet wide, and still extending. From this crosscut a drive has been put northwards, which is now in 25 feet, all in stone of payable quality, varying from 1 per cent. to 3·5 per cent. metallic tin. This drive, as well as the main crosscut, will be continued through the ore-body, and the level thoroughly proved. Arrangements are being made to sink the shaft still deeper. A battery, consisting of 20 head of stamps, double sets of plunger-jigs, Wilfley tables, and buddles, receive the stone from a Jacques crusher, which is connected to the surface plat by a tramway. The battery is run by water-power, situated at a higher elevation, and conveyed by means of a race 3½ miles in length, giving at the Pelton wheel a pressure of 120 lbs. to the square inch. A new dam is now in course of construction, which, when completed, will, with the old one, contain about 400,000,000 gallons of water—more than sufficient to keep the machinery running all through the year. The recent developments in No. 2 level, 240 feet, have been exceedingly encouraging, the drive put in toward the north still being in excellent stone, the assay being 1·87 metallic tin, equal to tin oxide 2·5 at 70 per cent. Considering the fact that experience in No. 1 level proved the northern end of the ore-body to be much richer than the southern end, there is every reason to expect richer stone when this level is opened up. From the above, it is clearly evident that, under the present systematic management, this property is being proved to be of value, increasing as depth is obtained.

South Esk.—This claim is situate about 3½ miles from Avoca. It is alluvial, and by careful management is made to pay.

St. Helens and vicinity.—In this portion of the district it is all alluvial working, but I hope in the near future a payable lode will be discovered. The principal leaseholder is the *Royal Ruby Company*, which is steadily working with payable results. Its race, which is twelve miles in length, gives it quite sufficient water, and, to all appearance, it has better prospects ahead.

Thureau's Deep Lead.—This company has, during the past year, had difficulties to contend with in repairs to its race. Now things are more satisfactory, and its ground has shown improvement. The other lessees working are *Patterson, P.*, and *Stevens and Fowell.* There are 22 miners' claims, and all the men are making fair wages.

Lottah and the Blue Tier.—At the *Anchor Mine* work is steadily proceeding. The season has been favourable, and the race has supplied a fair amount of water. It is much to be regretted that it has been found necessary to close down the *Liberator Mine,* as it promised well, but required more capital. The *Australian* ceased work for a time, but has now resumed. A tram is being put in, which will very materially be of benefit, causing far less handling the ore in conveying it to the battery. At the Blue Tier a strong Melbourne syndicate has taken up 13 previously-forfeited sections, in all containing 372 acres. The property will no doubt now be prospected thoroughly, and those who know the country are very sanguine as to results.

Weldborough and vicinity.—The Weldborough Company has at present 15 men employed, the work carried on being a dam at the intake of water-race at the Cascade River, continuing the low-level tunnel, the length of which will be about 1000 feet, and, as the driving lately is in much softer rock, a few weeks now should finish this very arduous undertaking. Sluicing the soft rock at a higher level is also being carried on with satisfactory results. The *Weldborough Company* has seven men at work with hydraulic lift in the old bed of the Weld. Heavy floods have proved a great drawback lately. About 40 men, principally Chinese, are working in this neighbourhood on miners' claims. The late wet season has been of great benefit to them, and some have made from £4 to £5 a man per week.

COAL.

There are evident signs that the *Mount Nicholas* and the *Cornwall Coal Mines* are recovering from the effects of the late strikes, the output for the last quarter being 13,242 tons 2 cwts., against 9520 tons the previous one. One hundred and twenty-seven miners are employed.

Mr. Commissioner CHAMBERS (stationed at Zeehan) reports :—

I have the honour to submit my Report upon the mining industry in the Western Mining District for the year ending on 30th June last.

Owing to the more settled state of the English money market, the satisfactory advance, during the latter part of the year in the values of silver and copper, the successful completion of negotiations for the amalgamation of the two large copper companies operating in the Lyell Division, and several fresh and important discoveries of minerals in various West Coast localities, the depression reported as existing at the close of last year may be said to have given place to a greatly improved state of affairs, and the effectual development of many mining properties hitherto only partially prospected may be confidently expected. Mining rents have been paid up very fairly, and I have been pleased to observe a decrease in the number of applications for protection of sections upon which work has been resumed. Dealing first with the Zeehan Division, I may point out that the returns (courteously supplied by the manager, Mr. T. Kapp) of the Tasmanian Smelting Company, Limited, evidence operations upon an enormously larger scale than in the previous year. During the twelve months this company—which has provided daily employment for 180 men—purchased 24,265 tons of ore, equalling a gross value of £212,054, and containing as follows:—Lead, 6924 tons; silver, 1,147,531 ozs.; gold, 2815 ozs.; and its export in bullion consisted of—lead, 6619 tons; silver, 1,131,226 ozs.; gold, 2474 ozs.; the gross value of the same being £204,402. The company smelted 23,981 tons of crude silver-lead ore, purchased 6593 tons of gossan flux, and quarried from its Balstrups section and sold to the North Mount Lyell Copper Company 4770 tons of iron-stone.

The out-put of one from the *British Zeehan Mines* aggregated 6646 tons, valued at £65,892, a marked advance upon the figures of the previous year—and mining operations during the year disclosed the existence of large reserves of highly-payable ore. This company's works are splendidly equipped, and the development of its various properties proceeds upon systematic and up-to-date lines. Apart from the ordinary mining expenditure the company spent during the twelve months in main-shafts and plats, cross-cuts, and unproductive drives, £4318; in machinery, £1382; and in rolling-stock, £200; totalling £5900 13*s*. 8*d*.

At the *Montana Mine* 2013 tons of first-class ore and 19,594 tons of second-class ore were raised. The latter, upon treatment by concentration, produced 1957 tons of marketable ore, making the total marketable ore shipped for the twelve months 3970 tons, of the net value of £44,674. The mine's work is represented by the following:—No. 1 shaft sunk 100 feet; No. 2 shaft enlarged and re-timbered 218 feet; winzes sunk 117 feet; rises put up 580 feet; crosscuts driven 352 feet; drives driven 2000 feet; stopes, 20,214 feet in length by 6 feet by 5 feet—606,420 cubic feet.

At the *Florence Mine* a large pumping and winding plant, capable of operating at 700 feet, has been erected, and a concentrating plant has been purchased for the mine. The main shaft is down 214 feet, and at 200 feet a level has been driven 300 feet. At 50 feet Astell's lode was cut, following the course of level to 140 feet, and varying in size from 2 inches to 24 inches. From this lode ore worth £1118 net has been won. At 140 feet and 150 feet carbonate of iron lodes have been met, and these doubtless will receive due attention.

The extensive properties of the renowned *Western Silver-mining Company* having been recently purchased by an influential British proprietary, are again to be placed in work, and the unwatering of the mine is now being carried out. Seeing that this mine up to 1901 provided employment for between 200 and 300 men, and returned handsome dividends to the former shareholders, it is expected that resumption of work, which is now assured, will, in a few months' time, largely contribute towards the future prosperity of this portion of the State.

Tributors continue working on the stannite lode at the *Oonah Mine* with satisfactory results.

At the *Silver King Mine* operations were suspended some time ago, and work has not yet been resumed.

My predecessor's forecast with regard to the *Hercules Gold and Silver Mine* at Mount Read has been amply fulfilled, the mine output having increased, and profitable operations being now in progress. The mine is making daily deliveries of fair-grade ore to the Zeehan smelting works, and the payment of a dividend to shareholders was recently announced.

Tullah (otherwise Mount Farrell) is now the scene of considerable activity, and at the *Mount Farrell* and *North Mount Farrell Mines* systematic development has taken place. The labour employed at the North Mount Farrell Mine has been increased to between 70 and 80 men, whilst 1100 tons of ore and 450 tons of concentrates from this mine have been sent out over the company's tramway—now completed to Rosebery—and sold, and 4000 tons of second-class ore are at grass awaiting concentration.

The *Comet Mine* at Dundas has been working throughout the year, maintaining an average monthly output of about 140 tons of silver-lead ore and 400 tons of ironstone flux, all of which has been sold to the Tasmanian Smelting Company. The Dundas field has recently claimed the attention of influential investors owing to the importance of its mineral deposits, and it is extremely likely that foreign capital will shortly be forthcoming to develop some of the more promising shows.

The revival of tin-mining in the vicinity of Heemskirk and Mount Agnew so far has been attended with satisfactory results. *Mayne's Tin Mine* having been bought by wealthy capitalists, a company has been formed to work the property, and the thorough development of the mine may be expected, and anticipations of rich results have been freely expressed by experts who have examined and tested portions of the property.

From *Connor's Tin Claim*, adjoining, a considerable quantity of good tin has been already won, and this property is being vigorously worked with satisfactory results.

Considerable activity has prevailed in the Comstock division, and very many sections have been pegged, either for lease or as prospecting areas. Discoveries of great promise have been lately made in this locality, and mineral sections in the vicinity are receiving marked attention.

Turning to the Lyell Division of the District, the most important event to be recorded for the year is the successful termination of the negotiations of the past few months for the amalgamation of the Mount Lyell Mining and Railway Company, Limited, and the North Mount Lyell Copper Company, Limited, and for the formation of a new and powerful company to take over the assets of the two companies mentioned, and to work the various valuable properties of the latter in conjunction. That such a course was eminently desirable in the interests as well of the shareholders of both the old companies as of the mining industry generally, has been long foreseen, and a long era of prosperity for the new combination can be safely predicted.

At the *Mount Lyell Mine* during the past year a regular daily output of 1000 tons of pyritic ore has been maintained, and with three to four furnaces in blast at the company's splendidly-equipped and capably-managed reduction works at Queenstown no less than 344,150 tons of ore have been submitted for treatment, the whole containing 6213 tons of blister copper, which produced, approximately, as follows :—

GOLD, FINE.				SILVER, FINE.				COPPER.			
	Approximate value.				Approximate value.				Approximate value.		
ozs.	£	*s.*	*d.*	ozs.	£	*s.*	*d.*	tons	£	*s.*	*d.*
22.278	94,681	10	0	604,860	61,316	13	7	6141	357,353	1	1

or a total value of £513,351 4s. 8*d*.

The company has acquired several additional properties adjacent to the "big mine," and the installation of a new and up-to-date electric light plant in connection with its reduction works and its other industries should be mentioned in any record of the year's operations.

At the *North Mount Lyell Mine* the ore won totalled 41,512 tons, of the estimated value of £288,588, and the year's work has only confirmed previous experience as to the richness and magnitude of the deposits in this famous property.

In consequence of the amalgamation of the Mount Lyell and North Mount Lyell interests, smelting at the Crotty works of the North Mount Lyell Company has been discontinued, and it is understood that in future the ore from this mine will be treated in conjunction with the Mount Lyell ores at the Queenstown reduction works.

The *South Mount Lyell Mine* resumed work during the year, employing for a time about 70 men. Under an arrangement with the North Mount Lyell Proprietary, 13,507 tons of low-grade pyritic ore were raised from the mine, and conveyed to the Crotty reduction works for fluxing purposes. Operations at the mine have been again suspended.

A change of management has occurred at the *Mount Lyell Blocks Mine*, where Mr. J. H. Crittenden has been succeeded by Mr. Nicholas. Work has continued as usual. The main shaft has been extended to 572 feet, and at 550 feet plats have been opened. The copper-bearing clays found on the property are being operated upon, and the erection of additional plant for treating the same upon an extensive scale is in contemplation.

The *Tasman Lyell* and *Comstock Mines* were amalgamated during the year, and prospecting work has been carried out on the consolidated property.

At the *Tasman and Crown Lyell Extended Mine* the tunnel has been driven to 1453 feet, and prospecting has been industriously carried out.

On the *Crown Lyell Section* steady work has taken place, but the operations do not call for special reference.

The *Great Mount Lyell Mining Company* has resumed work after having discontinued operations for upwards of a year.

Several parties are prospecting on the *Jukes and Darwin Field*, and it is hoped that several properties in this locality will receive greater attention in the near future. There is some probability of the *Lake Jukes Mine* being again put in work, under the management of Mr. H. S. Muir, lately mine manager of the North Mount Lyell Mine. Some gold has been found at Mount Darwin.

Work is proceeding at the *Coronation Mine*, where a small steam plant is on the ground, and unwatering of the shaft has taken place preparatory to further testing the property.

Numerous prospectors are to be found seeking gold in the vicinity of Lynchford, Hall's Creek, the Queen River, and Conglomerate Creek, and during the year a considerable number of small parcels of nice-looking gold have been brought in and sold at Queenstown.

The *Woody Hill and Macquarie Gold Mines* at Howard's Plain, near Queenstown, are now let on tribute to the Mount Lyell Mining and Railway Company, and a tramway connecting the properties with the Queenstown reduction works is now in course of erection.

The handsome building erected for the Zeehan School of Mines and Metallurgy in Main-street, Zeehan, was opened during the year, and is now in occupation, and well equipped. The School has been affiliated to the University of Tasmania, and in the hands of Messrs. F. W. Reid, A.S.A., S.M. (Director and Registrar), W. S. Watt (Associate Otago S.M.), R. J. Allan (Ballarat S.M.), and a number of competent honorary lecturers, the students (numbering between 60 and 70) have all facilities afforded them of obtaining excellent tuition in the mining course.

It is pleasing to report that a School of Mines has also been started on satisfactory lines at Queenstown. At present the School is carried on entirely by voluntary contributions, and with a staff of highly-qualified honorary lecturers and teachers, but the success attending its opening, and the patronage accorded by students (who have enrolled to the number of about 60) justify the belief that the institution will become well established, and will ere long attain equal prominence with the well-known sister institutions in the various States.

Mr. Registrar DONOHUE (stationed at Waratah) reports :—

I have the honour to submit my Report on the mining industry in the Waratah Division for the year ending 30th June, 1903.

During the year a good deal of prospecting has been carried on at and about Waratah. At Badger Plains, about seven miles south of Waratah, Walsh and party have discovered payable tin ore. They disposed of a portion of their interest in two sections to a Mount Lyell syndicate, which has 12 men, under the management of Mr. Tom Jones, prospecting different parts of the sections, with very satisfactory results. Several sections have been taken up in the vicinity of the Badger, and a good number of men are now prospecting them.

About two miles north-west of Mount Bischoff, Mr. James Kelly has discovered what is said to be a very rich find of alluvial tin. A syndicate is being formed here to put the necessary machinery on the ground and work it.

The *Mount Bischoff Tin Mine* remains much about the same. A good deal of alluvial tin is being got from the northern slope of the mount. During the year 1276 tons of ore have been sent away, the average number of hands employed being 220.

The *Mount Bischoff West Tin Mine* continued operations until the 21st of May last, employing on an average 30 men, and exporting 24 tons of tin oxide. The work was then suspended pending additional crushing power, and the erection of the necessary plant is expected to be shortly taken in hand.

The *Waratah Alluvial Tin Claim* during the year sent away 24 tons of tin ore, valued at £1440, with an average of four men employed.

The *Stanhope Alluvial Tin Claim* sent away 8 tons of tin ore during the year, with an average of three men employed.

Magnet Silver Mine.—Work for the year has been principally devoted to the exploitation of the ore-body. A steady output of from 240 to 300 tons weekly has been maintained throughout most of the ore being shipped to New South Wales, with about 70 tons weekly to Zeehan. A winze has been sunk from the lowest level (No. 4 adit) for 47 feet, proving the lode to be of undiminished value at that depth. This will shortly be sent down to the 100 feet below No. 4. At the southern end of the lode a very fine body of high-grade galena has been proved, and is being worked in the No. 1 south level. Another adit (No. 2 south) is now being driven 60 feet lower under this shoot. 100 men employed.

Long Tunnel Syndicate (formerly Mount Stewart).—This syndicate have about 40 tons of high-grade galena at grass, and is trying to raise the means to construct a tramway from Heazlewood-road to its mine. Two men employed.

Washington Silver Mine, Whyte River.—This mine has been idle some time, but is likely to start work again shortly.

The *Confidence Silver Mine*, Whyte River.—At this mine a small syndicate has been steadily working for the past 12 months, advancing the north drive of the lowest adit a distance of 580 feet from crosscut, or a total distance of 740 feet from entrance of adit. A strong and good body of concentrating ore is here disclosed, more or less richly impregnated with galena for approximately 300 feet, with small seams of ore on both hanging and foot walls.

Godkin Silver Mine, Whyte River.—Operations during the past year have been confined to driving a low level for the purpose of draining the old workings. Bad air and bad ground have been severe drawbacks, but have been successfully surmounted, and the water is now drained.

Godkin Extended, Whyte River.—Smith and Bell are now proceeding to drive a tunnel a distance of 700 or 800 feet for the purpose of intersecting a shoot of ore going under foot at the higher and older workings.

Wealth of Tasmania Copper, Heazlewood.—A shaft has been sunk about 60 feet, and a crosscut put in to intersect the rich body of ore disclosed on the surface. It is anticipated that the lode may be cut now any day.

THE NEW BROTHERS' HOME NO. 1 TIN MINING COMPANY, DERBY.

By James B. Lewis, Esq., Manager.

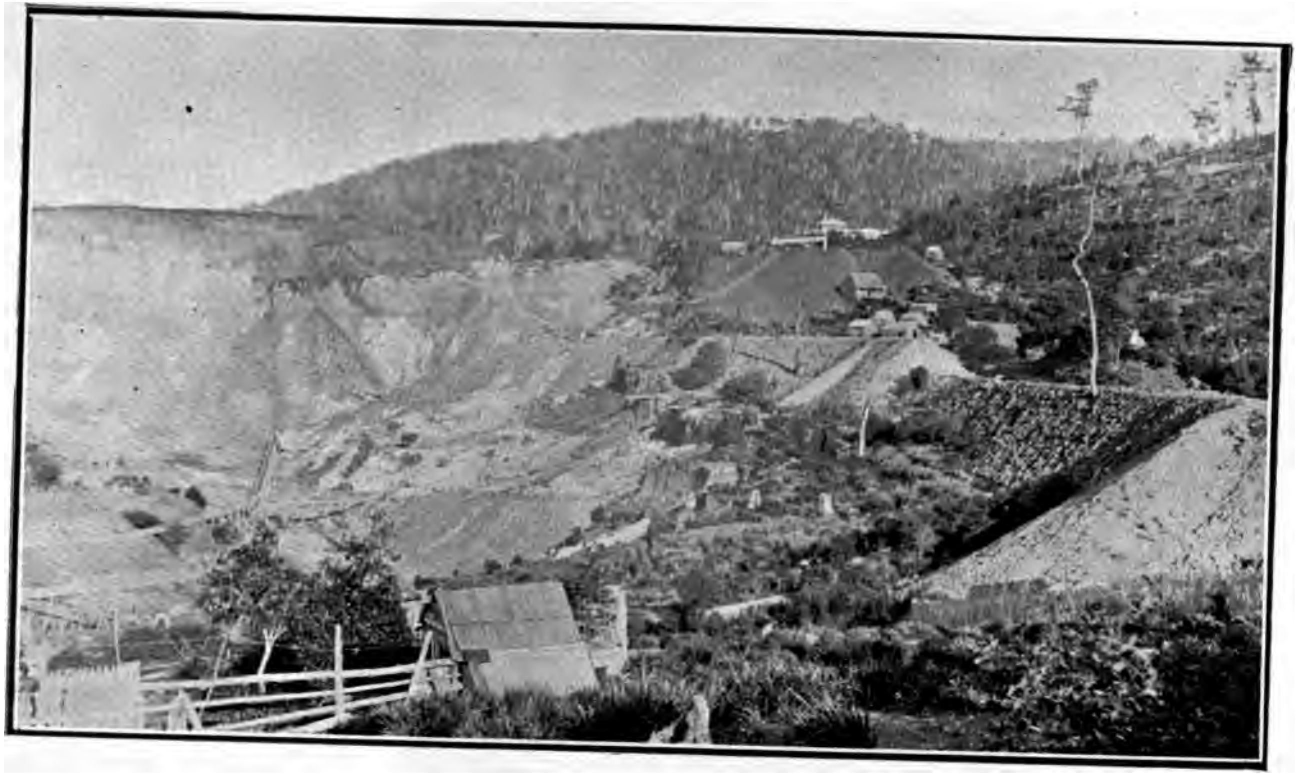
REMOVAL OF OVERBURDEN.

The overburden, averaging about 100 feet thick, consists of varying material, mostly of volcanic origin, the bottom layer being from 50 feet to 60 feet thick, and described by the Government Geologist :—"Microscopical examinations of specimens from the lower basalt mass at the Brothers' Home show the rock to be an olivine basalt, in which the felspar is mostly porphyritic, and the groundmass largely consists of small brownish crystals of augite," but locally known as "decomposed basalt," a soapy material containing hard boulders. These vary in quantity in different parts—from 25% to 50% of the whole—and also in size from that of road metal up to two or three tons weight. Over this is a layer of recent drift, poor in tin, and from 10 feet to 12 feet thick. Over this again is a layer of columnar basalt from 20 feet to 40 feet thick, containing blocks many tons in weight. Above this is a volcanic breccia of stone about 6 inches diameter, and containing boulders up to two or three hundred tons. This is of varying depth up to about 30 feet. The greatest depth of overburden over all was about 130 feet, and contained the largest and hardest rock. This was the first part attacked.

As the two top layers—columnar basalt and breccia—contained little material that could be removed by water, and especially as our water supply was limited and get-away restricted, we decided to remove this, as far as it was economical, by dry stripping. A large heading, 8 feet by 8 feet, was started in the layer of poor drift mentioned above, which it was considered, judging by the exposed faces, would allow of its being carried through entirely in this easy material with suitable grades. Unfortunately there was a sudden dishing of the underground surfaces, and the heading rapidly ran out of the drift into the columnar basalt, and had to be continued, together with its branches, in this material. The method of excavation adopted was that frequently used in railway cuttings. The top, or back, of the heading for a third of its width on each side was covered with laths in the usual way, or where possible with longitudinal round stringers running over two or three sets. The centre of heading was covered with transverse timbers, called by the workmen "Chinamen" or "Chows." These being easily removed, a pass could be made at any time at any part of the heading. The rails used in the roads were mostly 20-lb. rails—these were light, 30-lb. rails being more suitable, but were not at the time available—spiked down to the sleepers with large dogs, and coupled with fishplates. The roads were carefully laid and ballasted, and rails on curves curved to the true radius. Mine roads frequently suffer from inferior platelaying; good work in this soon pays for itself. The dogs are usually too small, fishplates are neglected, curves carelessly laid, and ballasting neglected, while points and c

crossings seem to exist rather to derail waggons than for any other purpose. The waggons were built to carry about four yards by measurement, or 2¼ to 2½ yards of material in the solid. They were fiddlestick self-tipping waggons, made on the mine—first with cast-iron wheels, which were unsatisfactory, then with steel wheels, and finally with main-line wheels and axles (cast-iron bosses, wrought-iron arms, and steel tyres). The material was picked down on to the heading when possible, or shot down, powder being generally used for shifting softer material gelignite for breaking-up hard rock. A truck would be pushed or breasted into the heading by the horse to the most convenient spot indicated by the fillers, who would withdraw two or three "Chinamen," and direct the material into the waggon, a trimmer in the heading arranging the loading with a rake. The waggon then ran down a flat grade to a turnout outside the heading, where the empty truck stood. The latter was then breasted in by the horse, which was then attached to the full waggon by a spring-bar. The waggon was drawn about a quarter of a mile to the tip; the driver then disconnected the horse by releasing the spring-bar; the horse got clear of the track; the waggon, with the momentum gained by the horse galloping a few yards before being released, ran against a bumper on the end of the tip, tipped itself, and then fell back on to the rear axle again. A fiddlestick waggon has the front wheels a little in front of the centre of gravity, and attached to the body, while the rear pedestals are not connected, thus allowing the body to tip free of them, the correct distance between the axles being kept by a frame known as a "fiddlestick." The horse was then attached to the rear of the waggon by the string-bar to draw it back to the heading. In this case only one waggon was run out at a time, the grades and curves making this a full load for one horse; but under more favourable circumstances two waggons could have been used, if branch roads were provided at the tip. This work cost a little less than 9½*d.* per cubic yard, including horses, explosives, roads, electric light, headings, waggons, labour, &c. When the circumstances were favourable two shifts were worked; the afternoon shift, however, never worked quite as cheaply as the day shift. This disposed of nearly all the top layers, except the material on one wing, which was left to come down on the heading at the lower face, about 100 feet below this level.

The lower faces were worked with the assistance of the hydraulic nozzle, and water with 320-feet pressure. For wherever water under pressure can be applied, with even moderate success, material can be removed much more cheaply than by any other method, some Californian results being claimed at less than a halfpenny per yard. Consequently this method has fatal attractions, for the first cost is frequently extremely heavy, the securing of water rights, construction of races, and means of distribution adding frequently 3*d.* or 4*d.* per yard on to the cost of removing material. Again, where it does not complete the removal thoroughly, and subsidiary means are required, the latter are usually inadequate or quite neglected. Then the disposal of tailings—where the natural outlet is restricted—becomes a serious matter. Time also becomes of importance, and although we are told that water will wear the hardest stone, it is frequently somewhat tedious waiting for it to do so. Efforts have been made to remove this heavy overburden by hydraulicing alone. With a large body of water, a large quantity of soft material to act as

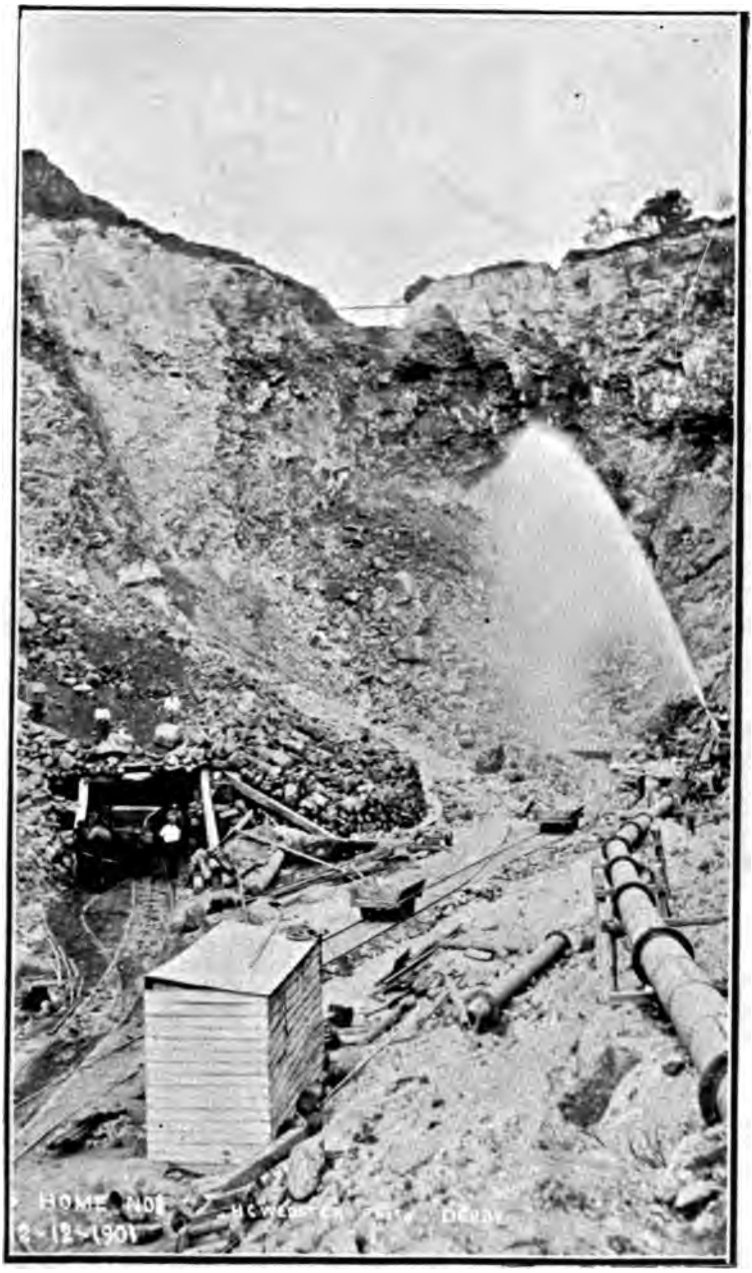


NEW BROTHERS' HOME No. 1, TIN MINE, DERBY.
General View.—In the face the darker shade shows overburden, lighter shade shows drift.

slurry-rounded boulders, and a steep tail-race, suitably lined, it can be done, but the achievement is neither speedy nor economical. Consequently some other method of handling the rock becomes necessary. Too often it is simply thrown back out of the way of the immediate work, to be handled again and again; sometimes wheelbarrows and planks are used; sometimes the stone is stacked carefully on the top of valuable drift; sometimes tram-roads are laid and hand-trucks used, the cost of removal in the latter case varying, according to circumstances, from 1*s.* 6*d.* to 2*s.* 6*d.* per cubic yard. Better results are claimed than achieved, as the stone is measured in the loose, as if it were solid, and trucks containing half a yard or three-quarters of a yard are reckoned as yard trucks, and, of course, tallies are not always reliable. In many cases it is a question whether automatic plant—some form or adaptation of a travelling-crane or steam navvy—might not be advantageously used in shifting this rock, and the matter was carefully considered in this case. But the first cost of such, the frequently scattered state of the rock, which would make the working of such unprofitable, and the difficulty of working it in conjunction with the water, would make its success problematical. Headings were, however, driven in the drift under the overburden, similar to those described in the first part of the paper, but with heavier timbering, and extended out in front in the form of a stage, and falls of overburden were brought down on these with the nozzle by undercutting in the drift. The small stuff was washed out where possible down temporary sluices, and the larger stone dropped down through the "Chinamen" into large waggons in the ordinary way, and as described before. When stone was plentiful and easily got, this cost, including all charges, about 8½*d.* per yard. When the face worked back from the heading and the slopes were flat, requiring the stone to be handled, the cost went up to 11*d.* Where there was not enough stone in the face to justify the use of headings, numbers of branch roads and sluices were brought up to the faces, and followed them up closely. When a fall came down here, as much stuff as possible was washed out of it with the nozzle and down the sluices, and the large stone left was then loaded into small fiddlestick waggons, containing about 1½ cubic yard each, or about 3 tons. Two of these were run out together, switched on to different lines at the tip, and tipped separately. These were made very low for convenience of loading, the backs were hinged and let down for the purpose of rolling large boulders in without lifting them; they were light, easily handled, and cheap of construction. Sometimes a small temporary stage was constructed level with the back of the truck, and the stones rolled down on to this were readily rolled into the waggons. These took but two or three minutes to erect consisting of a spar supported at the ends and decked with laths. The cheapest cost of trucking here was 9½*d.* per yard, and the highest 11½*d.* As time went on this cost would probably have been lessened as means of improvement were discovered. The cost of hydraulicing the remainder of the overburden was not cheap, on account of the disabilities under which we laboured. The regulations did not permit us to send anything into the river over 2½ inches diameter, we had no dumping ground, the river was always in a bad state on account of the materials sent in by the different mines, and on account of the dry seasons. For the latter reason, also, our water supply was very unsatisfactory, being frequently short, for months failing altogether, and usually only available at night. The cost was first 4 ·64*d.* per cubic yard, including all charges, but this afterwards increased to 5 ·17*d.* per cubic yard as the difficulties increased. With a supply varying from nothing to 8 sluice-heads, and about 40 men, the maximum amount removed was 15,225 cubic yards in a month, of which 8913 were trucked and 6312 sluiced; or for two years about 213,165 cubic yards, at an average cost, including all charges, of 8¼*d.* per cubic yard. In removing the overburden a quantity of drift had also to be sluiced, but being the highest and poorest, it contained a minimum amount of tin. This was saved by placing ripples in the tail-races, and shaking them up whenever any great amount of drift was sent down. These were cleaned out about twice a year, and the results indicated that with this rough method practically all the tin was saved, and without hampering or delaying the removal of overburden, which was considered the most urgent and important work.

The quantity of water required per cubic yard of material sluiced was at first 6039 gallons, but later, as disabilities increased, 8137 gallons. The Californian experience varies from 2455 gallons up to 9000 gallons—usually about 3860 gallons to the cubic yard of material removed. The higher figure has been frequently exceeded in this neighbourhood.

As the working arrangement with the Briseis Company removes two of the disabilities under which we have been working—shortness of water and lack of dumping ground—and as the worst of the hill is probably now removed, the future cost of removal of overburden should be reduced and the speed increased.



NEW BROTHERS' HOME No. 1, TIN MINE, DERBY.
Lower Face.—Showing Stage, &c., and Hand Trucks.

THE PROFITABLE TREATMENT OF SILICEOUS LOW-GRADE COPPER ORES.

By J. J. Muir, M.Inst. M.E.

THE question of the economic treatment of these ores is of the highest importance, and will require to be seriously undertaken at some future time. The writer, in discussing this question, does not propose to touch on the fire concentration or smelting methods. The majority of these deposits are situated in positions that would not admit of the importation of fluxes and fuels to effect a smelting operation at a commercial profit.

No doubt in many typical cases of self-fluxing ores, or with such fluxes and fuels adjacent to the copper ore deposits, the method of matte smelting and converting the product to copper could not be surpassed, either as regards continuous action in operation or the cost of same.

Unfortunately, the notable successes in that line do not account for the ultimate metallurgical destiny of the isolated deposits of the above classes of ores.

If we take chalcopyrite ore, distributed in small particles through a siliceous matrix, it will be sufficiently representative of the isolated deposits scattered through Australia and Tasmania. It will be clearly seen that there is a wide field for discussion regarding their profitable treatment. For some years past the writer has occupied a considerable portion of his time in an investigation and study of this class of ore from the other States and the West Coast of Tasmania. In consequence, the fact has been fully borne home to him that, in regarding these occurrences individually, and as a possible source of profit to their owners, the lines of investigation must be carried out in some other direction than fire concentration. The writer therefore commenced his lengthy series of investigations with the experimental concentration of low-grade copper sulphide ores by water.

Experimental Concentration by Water.

The aim in this test was to obtain a degree of concentration, both in bulk, by weight of material, and increase in copper contents of the concentrates, that would about return the costs of the operation, leaving any profit that might be possible to be recovered from the tailings. It appeared that if operation costs could be thus returned, a deferred profit might be acceptable. The test which most closely resembles this result will now be described. The ore-sample used was 100 lbs. of a typical low-grade ore, as described hereunder. It was carefully weighed after grinding and crushing on a castiron board, and passed through a sieve of 40 holes to the linear inch. The ore was then carefully concentrated in small lots in a riffle dish by an expert manipulator. The three products, investigated in rotation, are as follows :—First, the crude ore; second, the concentrates; third, the tailings.

The following is the writer's analysis of the crude ore :—

Copper. Per cent.	Iron. Per cent.	Silica. Per cent.	Alumina. Per cent.	Sulphur, alkali, &c., undetermined. Per cent.
3 ·9	9 ·55	50 ·15	16 ·85	19 ·51

The concentrates, after being dried at 100° C., were found to contain by weight 7 ·277 per cent. of the original ore-sample tested of 100 lbs., and a separation into the tailings of 92 ·723 per cent.

The writer's analysis of these concentrates was as follows :—

Copper. Per cent.	Iron. Per cent.	Silica. Per cent.	Alumina. Per cent.	Undetermined Per cent.
11 ·12	28 ·40	14 ·40	4 ·60	41 ·48

The tailings, after being dried at 100° C., were then assayed for copper, and found to contain 3 ·37 per cent., as the tailings contained by weight 92 ·723 per cent. of the original ore-sample this calculated out to a separation into the tailings of 3 ·13 per cent. of the copper contents of the crude ore, and a recovery in the concentrates of 0 ·81 per cent. of the copper contents of the crude ore.

The concentrates should then contain by calculation $0 \cdot 81 \div 7 \cdot 277 \times 100 = 11 \cdot 13$ per cent. of copper, proving the assay to be concordant to 0 ·01 per cent.

The small percentage of copper recovery in the concentrates is accounted for by the sliming of the ore.

The results of the writer's tests clearly show that, in the case of low-grade chalcopyrite ore, the grinding of the material to the necessary degree of fineness, to prepare it for lixiviation, pulverises the chalcopyrite contained in the rock to so minutely divided powder that each microscopic particle has a gravity unequal to settling in the bulk of water in contact with it; and, in consequence, it floats away on the surface of the water. The tailings from this experiment were then subjected to a lixiviation test, as follows :—A 5 per cent. solution of sulphuric acid by volume was adopted on the basis of one ton of solution to one ton of tailings, and as temperature plays an important part in the time of extraction, the vat was kept as nearly as possible at a temperature of 70° F., to agree with a climate that would be favourable to a method of this description.

The following table shows the time of extraction of the copper from the tailings under these conditions :—

No. of Assay.	Tailings.	Copper Per cent.	Extraction Per cent.
1	At start	3 ·37	Nil.
2	After 12 weeks	0 ·50	2 ·87

The conclusions at which the writer arrives is that the wet concentration of the sulphide ores of copper should not be attempted unless it is intended to make a profitable recovery from the prepared and residual tailings.

It might be possible by a lengthy lock-up of capital to obtain a slow profit in the way described in the foregoing test, but it does not recommend itself as having and particular merit.

In the large pyritic deposits in Spain, a country whose climate is eminently suited to it, large profits are made by natural lixiviation, when the persistent formation of sulphates can be relied on.

The writer regards the concentration tests by water as merely a useful basis from which to start in following up the inquiry.

PART II.—*Chemical Methods.*

The next stage in the investigation was a careful examination of the various chemical methods that have been employed or proposed in various countries for the treatment of this class of ore. The writer started with the old and well-known method of the chloridising roast. The principle involved in this process is the conversion of the copper sulphides to cupric chlorides by roasting the crushed ores with an admixture of salt. Very nicely drawn conditions require to be observed in order to obtain a high extraction of the copper. The roasting operation requires to be carried out in a muffle furnace provided with water-condensers, to recover the cupric chloride that is largely volatilised. The cost of this operation is therefore much higher than a roast carried out in an open hearth reverberatory calciner, where the heat generated by the fuel used is applied directly to the ore.

The other conditions necessary to successful operation were, according to the writer's tests, as follows:—First, the sulphur should not exceed 1¼ times the quantity of copper present; second, from 5 to 6 per cent. of copper is the outside limit that the ore should contain; third, the temperature of the furnace should not exceed dull redness. Over a number of trials on ores containing various copper contents, it was found that a proportion of anything less than four units of salt to one unit of copper gave most unsatisfactory extractions.

With all the conditions carefully observed and attended to, an extraction of 70 per cent. of the copper present could be relied upon. The writer's conclusions, however, are that the high charges of a muffle roast, coupled with the cost and importation of the necessary quantities of salt, would not admit of profitable treatment.

The Hunt-Douglas Method.

The principles laid down in this method were the next in order of the investigation programme. The crushed and roasted ores are treated by a solvent solution, whereby the copper is taken into solution as its chloride; and it is precipitated from the solution by the injection of sulphurous acid gas. The solution is regenerated by addition of salt. This process gives excellent results where the conditions are favourable to its operation. The necessary adjunct of a cheaply-mined pyritic body would strictly limit the economic value of its application. It can therefore be passed over in the present consideration of the various methods. Various other methods of minor importance were then tried, and, with one exception, they did not offer sufficient encouragement to follow up. The exception referred to is the method of roasting the crushed ores with ferrous sulphate. It is carried out very cheaply in some countries, in the following manner:—The crushed ores are made into stiff paste bricks with cementation liquors, and then burnt in kilns, thus converting the low-grade sulphides into sulphates, which are soluble in water. After arriving at this stage, it appeared essential that a satisfactory financial solution was of equal importance with a successful hydro-metallurgical one, and, in addition, a continuous and sustained action that would compare with that obtained by a smelting operation. If these opposing factors could be reconciled, it appeared evident that a satisfactory solution of this problem could be arrived at. The field of investigation was now narrowed down to definite lines of inquiry, and the final outcome was that the writer has demonstrated that the following method will fulfil all of the above conditions. All ore was selected for treatment typical of the low-grade siliceous ores surrounding the Mount Lyell field, and from the Mount Lyell Comstock Mine.

The following is a complete analysis of it by the writer :—

	Per cent.
Silica	48 ·0
Copper	4 ·56
Iron	13 ·29
Sulphur	12 ·60
Alumina	12 ·90
Zinc	1 ·17
Manganese	1 ·26
Lead	1 ·40
Magnesia	3 ·40
Oxygen, and loss	1 ·42
	100 ·00

It will be seen from the conditions that these ores contain considerable sulphur contents, and, moreover, that by a judicious selection of a small proportion of the ores as they leave the mine, the sulphur contents of that small portion can be considerably increased. This is the main factor on which the writer proceeded to work out this method for their profitable treatment, and he now proposes to follow the ores in their progress from the mine to their final conversion to a marketable product. The following is a detailed description of the method :—

Operations at the Mine.

When the ore is extracted from its place *in situ* by any of the usual systems, the aim should be to roughly and cheaply throw out the richer sulphides, to the extent of from 1-8th to 1-10th of the bulk of the ore treated. In the generality of cases an enriched sulphide zone has been deposited on the footwalls of these ore-bodies. If they are not greatly enriched in copper, owing to the increased amount of iron sulphide present, these narrow zones are notably increased in sulphur contents. When this is the case, the taking out of this portion separately would save the small additional cost of the rough selection. This smaller proportion is reserved for separate treatment, and the main bulk of the ore then goes forward to the regular plant.

Preparation of the Ore (main bulk).

The ore is first reduced to such a degree of fineness as the operator may find necessary, in order to expose the small sulphide particles to the oxidising flame of the calciner. The machinery employed for this purpose can be adopted by any particular operator to suit himself.

Calcination of the Ore.

This operation is of great importance, and a consideration of the chemistry of calcination is essential. When the ore is subjected to an oxidising roast in its pulverised state, it undergoes two important changes, viz., a chemical and a physical one. The chemical change is, firstly, the oxidising of the first atom of sulphur, which is feebly combined, with the generation of sulphurous acid gas; and, secondly, the combustion of the second atom with the generation of both sulphurous and sulphuric acid gases; and, finally, as the temperature is raised, the formation of oxides and sulphates of copper.

Although these reactions are well-known, it is not generally known that the physical change imparted to the finely-ground ore is of equal importance where a leaching operation is contemplated. The fine rock particles are granulated, and are made amenable to free percolation, and perfect leaching. This fact has now become so well recognised in America that the slimes from a previous operation, and which require a further wet treatment, now undergo a preliminary roast, when they are found in good physical condition for percolation and leaching. The stage to which the calcination of the ore is carried is the first important consideration, and, provided that the last of the sulphides as such are converted, it is a matter of no moment what proportion the residual oxides and sulphates bear to one another, and the charges can be drawn at that stage. It can be noted that the over-roasting of the charge has no prejudicial effect on subsequent operations, except slightly adding to the cost. Automatic reverberatory calciners, when used on a large proposition, are the most economical; but the hand-rābbled type on small and isolated mines are less costly.

Forced Leaching of the Ore.

The calcined ore is then transferred to the wooden leaching-vats (fitted with filter bottoms), and discharged gradually and hot from the calciner into the sulphurous and sulphuric acid solution in the leaching vats, derived from the ore that has been separately treated. The best mixing proportion is 200 gallons of solution to one ton of ore. The ore is well covered, and the temperature raised considerably by the hot ore. The discharge-pipe from the muffle furnace (described under the separate treatment) is then started, and the temperature is further raised by that means. The copper sulphates in the charge being easily soluble, the writer has provided for the attack on the oxides only. These are then attacked very rapidly by the sulphurous and sulphuric acid solution ,and the reaction completed in a very short time.

1st. $CuO + H_2SO_3 = CuSO_3 + H_2O$

2nd. $CuO + H_2SO_4 = CuSO_4 + H_2O$.

The hot oxygen of the blast also tends to oxidise the surplus, H_2SO_3 to H_2SO_4 which is an advantage.

Precipitation of the Copper.

The strong copper solution is then run through the filter-taps into the precipitating vats on to bars of pigiron, and the precipitation effected hot. About 1-12th of the copper contents will be retained by the dampness of the charge in soluble form. This can be recovered with one wash water.

Separate Treatment of the Selected Portion of the Ore.

This portion, being higher in sulphur contents than the main portion of the ore-body, is used for making the sulphurous and sulphuric acid waters necessary for leaching the whole of the ore. By a convenient muffle arrangement of a small type, the furnace gases are injected into the ore-extraction vats, thus generating the sulphurous and sulphuric acids in the solution. This is further increased by arranging a hot-air coil in the fire-chamber and passing the hot-air also through the muffle. As pyrites does not give up the whole of its sulphur in a closed muffle, this obviates that difficulty, and reduces cost.

Treatment Cost per ton of Crude Ore.

These costs have been carefully considered, and are on the conservative side :—

	Cost per ton.	
	s.	*d.*
Crushing schistose ores	5	0
Reverberatory roast	3	6
Labour on leaching-vats	0	6
Hot air	0	6
Sulphurous and sulphuric acid waters ...	2	6
Pigiron	1	0
Total	13	0

Against this a reduction of 4*s*. can be safely made on the copper values from the muffle roast, making the treatment charges against the ore 9*s*. per ton.

With the mining charges added, it will leave a range of profit on a fairly low grade ore. The precipitated copper would be the final product, and it would range in assay value from 70 to 80 per cent. of copper. There is a ready Australian market for this high-grade product, which only requires a common melting operation to convert it to copper.

Conclusion.

After a long investigation of this subject, the writer has arrived at the conclusion that this process will fulfil the conditions necessary for the successful treatment of these ores. The action is rapid, continuous, and complete. Various further economies in the costs of running can be made, notably in the regeneration of the solutions, &c.

A plant in full running order, capable of treating 100 tons of ore per diem, could be installed for about £2500; and for every 100 tons additional, an increase of 25 per cent. on that amount.

An advantage of this process is that it is not based on finely-drawn chemical equations, as most chemical processes are; and a few days' experience on an ore would show the best working conditions to each individual operator.

TRACHYDOLERITE IN TASMANIA.

By W. H. Twelvetrees, F.G.S., Government Geologist.

In 1889 evidence was laid before this Society by Mr. W. F. Petterd and myself, demonstrating the existence in Tasmania of two centres or districts characterised by eruptive rocks derived from elæolitic and theralitic magmas.

I now submit further localities for rocks belonging to the same great felspathoid series. One of these is the Table Cape Bluff, near Wynyard, on the North-West Coast, and another is the Nut at Circular Head. A third is One Tree Point, Sandy Bay, near Hobart, where melilite basalt has been identified, but only the first two will be dealt with in these notes.

The tertiary basaltic rock which forms the headland near Wynyard came many years ago under the notice of the late Professor Ulrich, who thought at the time that he could recognise the small water-clear hexagons which are abundantly visible in prepared slides as sections of the felspathoid mineral nepheline. Both my colleague and I were, on the other hand, disposed to diagnose the mineral as apatite, and we learned from the lamented Professor shortly before his death that he had arrived at the same opinion. Mr. Thos. Stephens often communicated to me his idea that this coarsely crystalline rock was a distinct flow from our common olivine basalt. The mere difference in texture did not appear to me a valid reason for assuming any further difference between the two rocks. However, in drawing up a classification scheme, the occurrence of a dyke of limburgite on the Emu Bay Railway Line, nine miles from Burnie, led me to hesitate, in view of the fact that Rosenbusch classes limburgite as belonging to the theralitic magmas. Renewed examination of the doleritic rock at Table Cape and Circular Head showed the presence of a felspathoid. The optical tests were confirmed by staining, and a specimen was sent Home to Professor Rosenbusch It was referred by him to trachydolerite, the effusive form of essexite. I wish here to acknowledge the readiness with which the professor has always aided in solving difficulties in Tasmanian petrology. His letter reads as follows:—"The compact basaltic rock of the Table Cape Bluff and Circular Head is best referred to the trachydolerite group. Besides labradorite, augite, olivine iron ore, and abundant apatite, it contains a colourless mineral with a very low refractive index and abnormal double refraction, which gelatinises in weak acid and allows much Na_2O to go into solution. I regard it as analcime. It is always allotriomorphic, and it is highly probable that this mineral is derived from nepheline. In a special slice which I prepared I saw distinctly in an isotropic spot the interference figure of a negative uniaxial mineral (nepheline)."

The hornblende, haüyne, and sphene, which are common in typical trachydolerite, are absent, so the rock is not a normal member of the family.

In the Table Cape rock, olivine is abundant as phenocrysts; augite as prisms, also in grains of the second generation; labradorite in slender twinned prisms; apatite in vertical and hexagonal sections, iron ores in numerous grains and cubes. There is a great deal of the feebly refractive analcime in plates of extreme tenuity. In some slides thin rectangular sections of the mineral determined by Professor Rosenbusch as nepheline are present.

In the Circular Head rock, the augite is in larger crystals and plates, and exceeds the olivine in quantity. It is the violet-tinted variety of diopside so common in nepheline-bearing rock. Apatite is abundant in the slides in the form of short columns, spindle-shaped, or hexagonal sections. Titaniferous iron or magnetite has separated out. The interstitial groundmass abounds with microlites and with isotropic or feebly refractive material. It is apparently saturated with analcime, and in one instance natrolite could be detected.

The macroscopic aspect of these rocks is doleritic. The Circular Head variety is somewhat coarser in grain than that of Table Cape.

Briefly, the abundance of apatite and analcime warn us that we are not dealing with an ordinary basalt, and the presense of nepheline, in however small quantity, confirms this belief.

It is difficult to suggest what relation the rock of these Bluff bears to the ordinary Tertiary olivine basalt of the coast. Both are of Tertiary age, but each is the product of a different magma, and such rocks hitherto have not been found associated. The two families would be represented as under—

Normal olivine basalt	Trachydolerite
|	|
Diabase (Dolerite)	|
|	|
Gabbro	**Essexite (not yet discovered)**

The term trachydolerite here has not the original sense in which it was used in 1841 by Abich, who understood by it a basic trachyte or a rock intermediate between trachyte and basalt. Its alkali percentage is high, viz.—6 to 11%, against the usual 3% or 4% in ordinary basalt. The variety of constitution points strongly to essexite parentage, and as essexite occurs physically connected with elæolite syenite, so trachydolerite is associated with alkali trachytes, phonolites, tephrites, &c. Its sp. gr. is 2·86.

Professor F. Loewinson-Lessing differs from this Rosenbuschian view, and ranges trachydolerite among monzonitic magmas, and not among essexitic ones.* He treats it as equivalent to ciminite (Washington), a passage rock between basalt and trachyte, and would suppress ciminite in its favor or in favor of "trachyte basalt." It is, then, considered the effusive equivalent of gabbro syenite or monzonite. But, as there is reason to regard the basic syenite known as monzonite as being not so much a passage rock between syenite and gabbro, as between normal syenite and alkali syenite, so trachydolerite must be looked upon as intermediate, not between normal basalt and trachyte, but between tephrite and alkali trachyte. The occasional presence in it of haüyne, sodalite, barkevikitic hornblende, anorthoclase, leucite, and ægirine points to the alkali magma.

It is possible that some of our other Tertiary basalts may, on closer examination, prove to be trachydoleritic; and the eventual discovery of the parent plutonic rock, essexite, is probable.

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* Kritische Beiträge zur Systematik der Eruptivgesteine : Tschermak's min. u. petrogr. Mittheilungen xix. 1900. iv. p. 303.

ON CERTAIN CALCAREOUS NODULES.

By Professor E. G. Hogg, M.A.

[Two photos.]

The nodules described in the following paper occur in certain bands in the upper members of the strata disclosed at Duff's quarry, in Forster-street, New Town. The nodule-bearing bands appear to be unfossiliferous, but both above and below them are other bands carrying numerous fossil impressions, including *Alethopteris australis*, *Thinnfeldia obtusifolia*, *Phyllotheca*, &c. The whole series of bands is just below the horizon of the New Town Coal Measures. The beds in which the nodules are found are grey and blue-grey in colour, traversed by thin layers of darker hue, thus giving rise to a banded structure; they may be described as a calcareous sandstone of fine texture, fairly tough, and showing little or no tendency to split along the planes of banding.

In general the nodules have the shape of double-convex lenses, giving in the most perfect forms a circle in plan and two intersecting circular arcs of different curvatures in elevation. The equatorial planes of the nodules were almost invariably parallel to the bedding planes; in the case of those nodules having bounding surfaces of different curvature the surface of greatest curvature was generally found to be the one lying uppermost. The larger nodules have an equatorial diameter about four inches long, and the lens at its thickest part is about half an inch through; on fracturing, the interior shows a crystalline structure, the surfaces exposed having a steel-blue sub-metallic lustre.

An analysis of the crystalline part of one of these nodules, kindly made for me by Mr. Ward, A.R.S.M., Government Analyst, gave the following result:—

Carbonate of Lime	44·0	per cent.
Silica, &c., insoluble in acid	50·6	„
Total Iron, taken as Peroxide...	4·7	„
Carbonate of Magnesia and loss.	0·7	„
	100·0	

The specific gravity is 2·5.

1 DEAN 2 3 4 5 6

1 DEAN 2 3 4 5 6 7 8

CONTRIBUTION TO THE PHYSIOGRAPHY OF TASMANIA.

By Col. W. V. Legge, R.A.

[Plate.]

No. 1.—Pine Island, Great Lake.

Pine Island is one of the five or six islets which, at wide intervals, dot the surface of the magnificent sheet of water known as the Great Lake.

Considering the shallowness of its waters and its extremely irregular outline, it is singular that there are so few islands in this lake. Those that do exist are all of small area.

Pine Island is situated in the north-eastern corner of the great bend of the lake, the eastern shore of which skirts the foot of the so-called "Sand-bank Tier," a rugged talus-strewn range, about 4 miles in length. The local name has its origin in the sandy shore which bounds this part, and along which the water is remarkably shallow, running out for about half a mile, with a depth of not more than a couple of feet.

During a recent visit, I was much struck with the singular character of the shore of this island; and the desirability suggested itself of writing a short descriptive account of the spot for the information of our Fellows, and in the hope that a satisfactory explanation of the causes which have led to the formation which I noticed, may be arrived at from a discussion on it.

The distance from the head of the lake, where the boat belonging to the "Improvement Association" of Deloraine is kept, is about four miles, and on the afternoon of my trip, in March last, we sailed down (my son and myself), accompanied by Police Trooper Archer, in about half an hour.

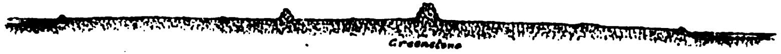
The long, low outline of the island is visible from the starting-place, and as we neared it the basaltic "tors," which rise from its centre, became conspicuous. It is said to have been formerly covered with timber, the King William Pine having been chiefly in evidence, but the only signs of this that now exist are the gaunt and bleached trunks of one or two "Cider" gums and one pine. At the "Cove," on the eastern shore, there are several large fallen trunks of pines lying partly in the water: further evidence of the ravages of fire! The stupid practice of setting fire to the country by shepherds and others, which obtains in the western wilds of this country, is probably answerable for the desolate state of this islet at present. On nearing it, however, scattered green bushes are seen, chiefly near the margin, and these are the only prominent signs of botanical life until one lands, when the surface is found to be fairly covered with the usual coarse vegetation and low bushes found in all open tracts of this upland region.

At about half a mile distant the singular character of the shore becomes apparent, the entire coast-line consisting of a raised terrace, rising about 7 feet from the water, and looking as regular and uniform in structure as if it had been built artificially. In looking for a landing-place we were able to examine the structure of this curious terrace, and found the rocks composing it to vary from somewhere about one ton in weight to stones of nearly one cwt. The face forms a regular slope of 35° or steeper in some places with an almost concave profile, and stands on a formation of small rocks below the surface, projecting outwards about four or five feet as a rule, and skirted by a flat bottom of shingle, the water being not more than three feet deep. The water is shallow all round the island, as indeed it is throughout the better part of the great bay at the north of the lake.

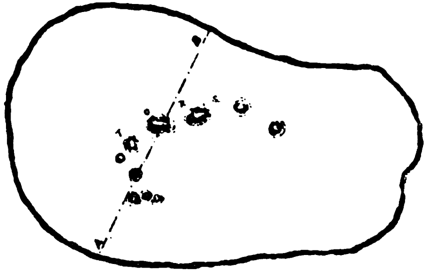
The contour of the west side is circular, the terrace sweeping round in regular curves to the northern and southern sides, which run almost due east to the eastern end, where the terrace is broken by a little cove of shingle, which my son visited, but which I did not, myself, see. The island is about 600 yards long, 250 broad at the widest part, and contains about 30 acres. The shape is roughly given in the accompanying sketch, enlarged from the .1-inch to the mile map of the lake. On landing, we found the group of "tors" we observed in the distance to consist of six or seven mounds of basalt, rising more or less perpendicularly from the surrounding and, in some directions, almost level land, the whole describing a crescent across the centre from west to east. The highest of these eminences was in the centre of the island, and rose to a height of 45 feet above the water, and 30 feet from the ground at its base. The others, at a distance of about 30 to 50 yards from each other, were smaller, the groups at the west end of the crescent being sub-divided into detached rocks. The class of rock, both in the "tors" and the boulders which form the terraced show, is greenstone, of which the entire structure of the island also consists, as here and there the same formation projects through the shallow soil. In view of this fact some clue is obtained as to the cause of the terraced formation of the shore.

The island lies almost in the middle of the strait—about 1½ mile wide—which connects the two great water tracts at the north of the lake, namely, the large "North-West Bay" and equally wide "East Bend"; and from all points of the compass, save two—north-east and south-west—it is exposed to the full force of the waves, with several miles of water behind them. The prevailing gales on the lake are from the north-west, south-south-west and south-west, and an extremely violent sea rises with them. After a hard winter, when the ice is from three to five inches thick, it generally breaks up during these gales, and drives in huge floes, with great violence, on the shore of the island. It seems, therefore, reasonable to suppose that, during the course of the centuries, the effect of wave and ice pressure has been sufficient to cast up what was formerly a foreshore of scattered stones and boulders into rampart, or terrace, now existing. Once this began to assume the elevated character of a roughly-formed terrace, there is no doubt that the ice movement and force of the waves would gradually mould it, little by little, into its present form. The formation of the rampart is equally regular on the south-west and north-west sides, the latter part being somewhat less exposed to heavy weather. Round the whole island, with the exception of the cove or break on the east side, the rock bank is almost of uniform height.

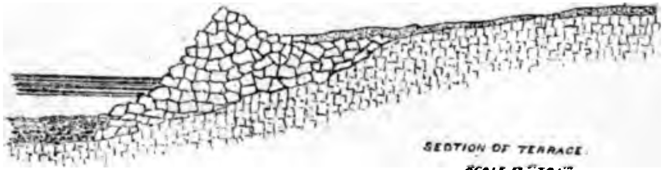
As the botany of these high regions is interesting, it may be proper to remark on the vegetation which we found clothing the islet. The surface is practically level, there being a gentle rise from the shore towards the "tors" in the centre. The soil is, for the most part, covered with a dwarf form of the ordinary cattle or "thatch" grass (*Poa cæspidosa*), thickly interspersed and patched with the Epacris-like bushes *Pultenœa rubumbellata*, *Bechia gunniana*, and *Comesperma retusum*. The second of these was in flower at the time of my visit, and gave colour to the sward. We noticed that the dead tussocks of "thatch" grass (*Poa*) were partly covered with a curious earthy-looking deposit lying on them in thick patches, and on closely examining them found, to our surprise, that the covering was a lichen. The grass is killed in the usual way, by cold and age, as in the lowlands on our cattle-runs, and is



IDEAL SECTION ON AB. , SCALE 30ft TO 1 inch



PLAN, ENLARGED 12 TIMES
FROM 1in TO-MILE MAP



SECTION OF TERRACE.
SCALE, 12ft TO 1in

PINE ISLAND.

del

JOHN VAIL, GOVERNMENT PRINTER, TASMANIA.

apparently then fastened on by this curious lichen. Of flowering grasses, we gathered the tall Alpine Holy grass (*Hierochloë redolens*), the *Craspedia richei*, whose tall stalk and downy, button-shaped flower towered above the dwarf *Poa* grass; we also gathered two other species (*Hypochæris radicata* and *Prasophyllum fuscum*). On the northern shore, near the bank of stones, and here and there elsewhere, isolated bushes of the "Mountain Pittosporum" were found, and these were the tallest shrubs on the island. The Pepper tree (*Drimys aromatica*), with its red stems and berries, was more plentiful than the last, and grew in company with the pretty little bush *Bellendena montana*, which has green leaves, with a red obverse surface. The "Yellow Bush," so well known on the mountain plateaus of Tasmania, with its intensely hard wood, is found on the island, as well as round the shores of the lake; but I have not seen it anywhere so plentiful as on Ben Lomond. Other small shrubs make up the vegetation we observed, and are included in the list at the end of this note, and for the identification of all of which I am indebted to Mr. Rodway.

As regards the zoology of this lonely little tract, one would naturally expect to find it devoid of life; but Mr. Archer assures me he once saw on it the largest specimen of a Porcupine (*Echidna*) he ever came upon; the inference of which discovery is, that this animal must be a permanent inhabitant of Pine Island, or crossed over on the ice previous to a thaw. Whip-snakes are also said to be denizens of it.

The only bird seen was the ubiquitous Pipit, or Ground Lark (*Anthus australis*). The little Gull breeds, at times, plentifully on Garden Island, near the Police Station, and no doubt affects this one, but we had not time to look for evidence in the shape of old nests, many of which we came upon in the former islet.

The list of grasses and shrubs observed on Pine Island is as follows—

SHRUBS.

Drimys aromatica	Pepper Tree.
Pittosporum bicolor	Pittosporum.
Orites revoluta	Yellow-bush.
Pultenæa rubumbellata......	Native Wallflower.
Bellendena montana	Mountain Roebel.
Coprosma nitida	Mountain Currant.
Comesperma retusum	Purple Broom.
Olearia myrsinoides	Rough-leaved Daisy-tree.
Ozothamus Hookeri	Hooker's Scent-bush.
Bæchia gunniana	Gunn's Bœckia.
Hakea microcarpa	Small-fruited Hakea.

GRASSES.

Hierochloe redolens	Tall Holy Grass.
Poa cæspidora	Thatch Grass, Dwarf.
Craspedia richei	Soldiers' Buttons.
Hypochæris radicata	Deep-rooted Dandelion.
Prasophyllum fuscum	Brown Fly-Orchis.
Prasophyllum patens	Fly Orchis.
Brachycome sp.	Mauve Daisy.
Helichrysum bracteatum	Coarse-flowered Everlasting.
Celnusia longifolia	Mountain Aster.
Eriochilus autumnalis	Autumn Orchis.

THE TOURMALINE-BEARING ROCKS OF THE HEEMSKIRK DISTRICT.

By G. A. Waller and E. G. Hogg, M.A.

The Heemskirk district was visited some weeks ago by one of the authors in the course of his official duties as Assistant Government Geologist. Most of the field observations then made have already been published in the report on the district recently issued by the Mines Department*, but the necessity of writing these reports as soon as possible after the examination of the district in question is completed precludes the possibility of a minute examination into the microscopical character of the rocks prior to publication. In the case of the Heemskirk district, not only are the field observations of more than ordinary interest, but the additional evidence afforded by micro-examination of the rocks is important. The authors, therefore, think that a short description of the rocks, both as regards their microscopical characters and their field relations, may not be out of place among the proceedings of this Society. It may also be mentioned that, since the publication of the Mines Department report, other portions of the district have been examined, so that some of the field observations here recorded are published for the first time.

Mt. Heemskirk is situated on the West Coast of Tasmania, about 24 miles north of the entrance to Macquarie Harbour. The district may be regarded as extending along the coast from Trial Harbour on the south to Granville Harbour on the north. The major axis of the mountain range runs approximately parallel to, and about 4 miles distant from, the coast. Mt. Agnew is the most southerly and the highest peak of the range, and rises about 2800 feet above sea-level. The mountain range is composed almost entirely of granite, which extends along the coast from a little north of Trial Harbour to beyond Granville. To the south and east of the granite the Silurian slates and sandstones outcrop, and these have suffered metamorphism near their contact with the granite.

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* **Report on the tin ore deposits of Mt. Heemskirk, by G. A. Waller, Assistant Government Geologist.**

The Normal Granite.

The rock which we have termed the normal granite consists of a medium to coarse-grained biotite granite. It is much more widely distributed than the other types, and appears to be of more uniform composition. The rock shows, on microscopic examination, the following minerals:—Orthoclase, plagioclase felspar, biotite, quartz, tourmaline, iron pyrites, and apatite. The felspars have suffered much decomposition; the clouded appearance of the plagioclase felspar makes the determination of its character very difficult, but the low angle of extinction points strongly to its being oligoclase. It has preceded the orthoclase in the order of crystallisation. The biotite is very pleochroic, and contains on the whole very few inclusions; it appears to have undergone very slight alteration, but it is occasionally somewhat bleached, and a small amount of resorption with separation out of opaque material has taken place. Apatite in small grains is rare, and small masses of iron pyrites, destitute of crystal boundaries, are present. The main interest of the slides centres round the remaining minerals, quartz and tourmaline. The tourmaline occurs as short slender opaque rods, traversing the quartz grains in all directions. The rods, as a rule, are quite straight, but in some few instances they are curved; a radiant structure is very characteristic, the centre of radiation being sometimes a minute speck of opaque matter; in other cases the rods appear to radiate from the line of separation of two quartz grains, and the rods then show a tendency to lie parallel to this line of separation; no case was observed of a rod crossing the line of separation and penetrating both of two adjacent quartz grains.

The distribution of the rods in the quartz is very capricious; they crowd some grains and are comparatively rare in others, while sometimes the same grain may be rich in them in one part while the remainder of the grain is absolutely destitute of them. In one marked case a quartz grain is crowded with needles, and carries a moderate amount of minute opaque specks, while the remainder of the grain, though in optical continuity, is devoid of rods, and almost devoid of opaque specks. The phenomenon would appear to point to the presence here of quartz of two generations, the younger quartz having been deposited from a solution free from tourmaline, and having crystallised round an eroded grain of the older quartz in optical continuity with it. The presence of veins containing iron pyrites in the vicinity seems to support the hypothesis that this normal granite has undergone a small amount of metasomatic change.

Tourmaline Granites and Aplites.

These rocks occur in considerable quantities in many parts of the district, especially in the vicinity of known tin-bearing deposits. Tourmaline granites occur in the form of dykes and masses in the normal granite, and in the latter condition often extend over areas of some hundreds of acres. The tourmaline aplites, or fine-grained tourmaline granites, occur as irregular masses and nodules in the tourmaline granites, and also as dykes, both in the tourmaline granites and in the normal granites. Dykes, nodules, and masses of non-tourmaline-bearing aplite are also found in the normal granites, and dykes of the same rock traverse the tourmaline granite.

The tourmaline granites exhibit a large amount of variation, both in the proportions of the several minerals contained and also in the size of the constituent grains. We have only two somewhat imperfect slides of these rocks at our disposal, so that our description must be principally confined to macroscopical characters. The minerals which may be seen with the naked eye comprise the following:—Felspar, quartz, tourmaline, muscovite, and a dull green mica (probably biotite which has been partly altered to chlorite).

The most striking characteristic of the rock is in connection with the distribution of the tourmaline. This occurs in patches or bundles of radiating needles or prisms, from 1 up to 3 inches in diameter, usually associated with quartz. As the granite becomes finer grained, and approaches to the aplites in structure, the tourmaline loses its radiating character, and, together with quartz and a little felspar, forms more or less well-defined balls or nodules (quartz tourmaline nodules), which occur sometimes distributed at regular intervals through the granites, and sometimes collected together in masses. The groundmass of the rock consists of a medium to fine-grained crystalline granular mixture of quartz, felspar, and two micas. Small miarolitic cavities may be often observed, into which the crystal faces of quartz and felspar protrude. Under the microscope the felspar is seen to consist both of orthoclase and plagioclase, both much decomposed. The quartz differs from that of the normal granite, in that it contains no microscopic rods of tourmaline, the whole of the latter mineral appearing to be concentrated in the quartz tourmaline nodules.

With the exception of a little muscovite, there is no mica present in our sections. It may be said that the mica is generally present in much smaller quantities than in the normal granites, and in some cases it appears to be entirely absent.

From the above description it will be seen that the tourmaline granites differ from the normal granites in the following particulars:—

(1.) The greater amount of variation exhibited by the tourmaline granites, both in the mineralogical composition and in the size of the constituent grains.
(2.) The frequent presence of miarolitic cavities.
(3.) The presence of macroscopic bundles of radiating tourmaline or of quartz tourmaline nodules.
(4.) The absence of microscopic rods of tourmaline in the quartz.
(5.) The presence of small quantities of muscovite, which appears to be absent from the normal type.
(6.) The lesser abundance of biotite.

The tourmaline aplites, as has already been stated, occur in irregular masses in tourmaline granites, and as dykes in both the tourmaline granites and the normal granites. In neither case is there any sign of parting at the contact between the aplite and the granite. In the case of the dykes the walls are well defined, but there is no distinct plane of division, the one rock appearing to "grow into" the other. This phenomenon is ascribed by Rosenbusch* to the fact that the aplite was introduced into the fissures while the granite was still in a highly heated condition. In the case of the masses the contact is even less sharp, and it is sometimes impossible to say within two or three inches where the aplite begins and the granite ends. Occasionally the masses of aplite throw out irregular apophyses into the surrounding granite. The whole appearance of the masses gives the impression that they were formed while both magmas were still liquid, and one may ascribe the irregular shape of some of them to movements in the still molten magma. The aplites are usually much richer in tourmaline than the tourmaline granites. The mineral is, however, confined to the quartz tourmaline nodules, which are often very abundant, and generally are almost perfect spheres. The quartz tourmaline nodules withstand the decomposing action of the atmosphere for a longer time than the surrounding rock, and this causes them to stand out on the weathered surface, giving the rock a very remarkable appearance. From the same cause the subsoil in some localities is largely composed of these nodules.

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* H. Rosenbusch. Elemente der Gesteinslehre, p. 215.

Under the microscope the groundmass of the tourmaline aplites consists essentially of orthoclase, plagioclase, and quartz, with small quantities of both biotite and muscovite. The plagioclase is oligoclase-andesine, or albite. Measurements of extinction angles on sections cut approximately perpendicular to the twining lamellæ give results ranging from 9° to 16°. Some of the quartz appears to have preceded the felspar in order of crystallisation. Some of the grains have defined crystal edges, and they often protrude into, or are included in, the felspar crystals. Like the tourmaline granites, the quartz contains no microscopic rods of tourmaline. One section was prepared, showing the junction between a quartz tourmaline nodule and the surrounding rock. As the centre of the slide is approached, grains and hypidiomorphic crystals of tourmaline make their appearance; they are, for the most part, yellow-brown in colour, and show faint pleochroism. As the centre of the nodule is approached, the felspar—which is almost entirely plagioclase—dwindles, and the rock appears to be entirely constituted of quartz and tourmaline. The quartz occurs sometimes in the form of hypidiomorphic crystals surrounded by tourmaline, which is almost entirely without crystal boundaries; the tourmaline is blue in colour, and moderately pleochroic.

Other slides of nodules show an intensely pleochroic tourmaline of blue colour; the crystals are sometimes of tabular habit, and enclose grains of quartz in such a manner as to give rise to a pœcilitic structure. A small amount of much-altered plagioclase felspar is also present; it has preceded the tourmaline in the order of crystallisation. Rods of tourmaline are absent from the quartz of these nodules. Although not observed in the slides, a small quantity of tin oxide appears to be always present in the quartz tourmaline nodules. A small prospect was always obtained by crushing and vanning the stone, while a bulk assay taken from the nodules occurring at the Federation Mine yielded 0·2 per cent of metallic tin.

The tourmaline aplites may be said to differ from the tourmaline granites in the following particulars:—

(1.) They are finer grained.

(2.) They contain quartz tourmaline nodules in greater abundance, and in larger and more perfectly developed spheres.

(3.) Some of the quartz has preceded the felspar in order of crystallisation. The structure may be described as partly panidiomorphic.

Normal Aplites.

Many of the aplites do not contain quartz tourmaline nodules. They occur in the form of dykes in the normal granite and in the tourmaline granite, and as masses and nodules in the normal granite. One case was observed in which a small dyke of aplite contained a central seam of large crystals of quartz and felspar (pegmatite) with small cavities or druses, into which the crystal faces project. In many other cases miarolitic cavities were observed irregularly distributed through the dykes. Microscopically, the normal aplites closely resemble the groundmass of the tourmaline aplites. They are somewhat even-grained rocks, composed essentially of orthoclase, plagioclase felspar, with a little biotite and accessory tourmaline and apatite. The felspars are much decomposed; the plagioclase felspar, which is relatively less abundant than in the normal granite, appears to be oligoclase-andesine, or albite, and has preceded orthoclase in order of crystallisation. The quartz is more abundant than in the normal granites, and in some cases the grains carry rods of tourmaline quite similar in appearance to those described in connection with the normal granite. Their disposition is very capricious, as they are numerous in some grains and quite absent from others. The biotite shows bleaching and resorption phenomena; apatite occurs as an inclusion in biotite. Some of the quartz has defined crystal edges; it also appears as eyes in the orthoclase. When present in the latter form, tourmaline rods are absent.

Quartz Tourmaline Reefs.

The rocks which have now been described form in part the wall rocks of numerous quartz tourmaline reefs which occur throughout the district. We propose to use the term " reef " in the sense in which it is used locally, and by most mining men in Australia, viz., to denote any non-clastic tabular deposit composed largely of silicious material irrespective of its supposed mode of formation. Until comparatively recent years the filling-matter of fissures was regarded as being divisible into two well-defined classes—one formed by cooling from a molten condition, the other formed by precipitation from aqueous solution; and these classes are still known as dykes and veins respectively. It is, however, now generally conceded that it is impossible to draw any sharp line of division between these two types, and our investigation of the quartz tourmaline rocks of the Heemskirk district affords evidence of this fact. We find that there are both quartz tourmaline dykes and quartz tourmaline veins, and also types which occupy an intermediate position. As it is often difficult to decide at once to which class any given deposit belongs, it is evident that a general term is desirable, and the term "reef" appears to us to be quite suitable.

Quartz Tourmaline Veins.

It is a well-recognised fact that fissure veins are often not merely "fissures filled with mineral matter;" the material forming the vein may have been either deposited in an open cavity formed by the fissure, or it may have been deposited as a replacement of the wall-rock, or of some of the constituents of the latter. In the quartz tourmaline reefs of the Heemskirk district the greater part of the material has been deposited as a replacement of the wall rock, and only a very small portion as the actual filling of the fissure. These two portions of the vein we propose to distinguish by the terms "vein rock" and "vein stone," the former denoting that portion of the vein which has been formed as a replacement of the wall rock, and the latter that portion which has been deposited along the plane of the fissure, and generally in an open cavity.

The quartz tourmaline veins consist of tabular deposits composed essentially of quartz and tourmaline, traversing both the granite and the surrounding Silurian strata. There is a central seam or fissure filled usually with tourmaline, or quartz and tourmaline (the vein stone), and on either side of this is a granular rock composed of quartz, quartz and tourmaline, or quartz and white mica (muscovite or lithia mica) and tourmaline (the vein rock). Both the vein stone and the vein rock may carry tin oxide. The former is sometimes very rich in tin, the ore being often beautifully crystallised; in the latter the tin oxide occurs in crystalline grains, and is often finely disseminated. Pyrites appears to be an invariable constituent wherever the veins have been explored below water-level. It occurs in bunches in the vein stone, and also disseminated through the vein rock. In some cases the vein rock consists almost entirely of granular quartz and pyrite, the latter having the appearance of replacing the felspar of the granite. Besides those already mentioned, most of the other minerals which are of common occurrence in tin veins are present in small quantities, viz., bismuthinite, molybdenite (rare), arsenopyrite, chalcopyrite, galena, and zinc-blende (both of these rare, and in very small quantities), fluorite (in small quantities), and smoky quartz.

The vein rock differs very greatly in the amount of tourmaline present. Often it is composed almost wholly of quartz, but at other times the only quartz present appears to be that which formed the original quartz of the granite, the whole of the felspar being replaced by tourmaline. In other cases the felspar has been replaced by white mica, with or without the addition of quartz and tourmaline. The vein rock then forms a typical greissen. The tourmaline is of two varieties, the black or iron tourmaline and the green or alkali tourmaline. Although tin ore is associated with both varieties, the green tourmaline appears to be much the more favourable indication for tin.

The veins vary in width from a few inches up to 20 or 30 feet; in the latter case there are usually a number of parallel fissures filled with tourmaline running through the vein rock, and the mineralisation has evidently spread outwards from these fissures until the adjacent zones of replacement met in the centre. Often bands or lenticular bodies of unaltered granite exist within the reefs between two such zones. The veins generally run in parallel groups, but often there are several main directions of strike in the same locality. When the veins cross one another there is usually no faulting, pointing to the fact that the fissures were produced by contraction of the granite on cooling. The proof of the metasomatic nature of the vein rock is very conclusive, and may be deduced both from the field evidence and from the examination of thin sections under the microscope. When the veins occur in granite, the vein rock is granular, and the size of the grains is the same as that of the adjacent granite or aplite; there is no parting between the granite and the vein rock, the one seeming to pass over into the other. When the veins traverse sedimentary rocks, the vein rock, or metamorphosed wall rock, retains the original laminated structure. Original differences in porosity or composition have led to deposition of quartz along certain layers, and tourmaline along others, with the result that a black-and-white striped rock is produced, of very striking appearance. Perhaps the most striking field evidence of replacement is to be seen when a vein passes through a granite or aplite which is rich in quartz tourmaline nodules. The nodules are seen in the same abundance and of the same size in the vein rock as in the adjoining wall rock. When the nodules are absent from the wall rock, they are also absent from the vein rock. It is quite evident that the quartz tourmaline nodules, which consist of the same material as was contained in the solutions, were not attacked by them, but remained unaltered while the surrounding felspar of the granite or aplite was replaced.

Microscopic examination of the vein rock entirely confirms these conclusions. Two slides were prepared from a vein-stone poor in tourmaline, replacing granite, which contains quartz tourmaline nodules. The vein stone also contains nodules, but these were not sliced. Both slices are almost entirely made up of quartz, which is present in two forms. It occurs either as large grains, having the usual aspect of the quartz of the tourmaline granites (containing no microscopic rods of tourmaline), and as very small grains confusedly arranged, so as to produce a mosaic structure. A small amount of pleochroic hypidiomorphic tourmaline, enclosing small grains of quartz also occurs either entirely within or nearly surrounded by the mosaic quartz. The tourmaline and mosaic quartz are evidently replacements of the felspar of the granite. There is a tendency of the mosaic quartz to extinguish simultaneously over fairly well-defined areas. The junction of two such areas may be a straight line or an irregular line, suggesting strongly that the orientation of the quartz grains was conditioned by the position of the original felspar grains of the granite, the straight lines representing the contact planes of two adjacent members of a polysynthetically-twinned felspar.

Three sections were cut of quartz tourmaline rock replacing normal granite in which quartz tourmaline nodules were absent. These slides are composed of quartz, tourmaline, and a small amount of opaque matter, disseminated through the former mineral. The two types of quartz which have already been described as occurring in the quartz rock are also present in these slides. The large grains contain a little opaque matter and fluid pores arranged somewhat in linear fashion, and opaque rods of tourmaline showing radiant structure of exactly the same nature as those described as occurring in the quartz of the normal granite. There can be no doubt that these grains represent the original quartz of the granite. The mosaic or secondary quartz is of the same nature as that described in the quartz rock, but is less abundant, and in one of the slides is absent. The tourmaline occurs as idiomorphic crystals of prismatic habit in the secondary quartz, and as confused, ragged masses, sometimes fibrous in structure, and then showing tendency to radiant arrangement. We believe that this tourmaline is a replacement mineral after felspar and biotite, no trace of either of which minerals can be seen in the slides. Contrary to what was observed in the case of the replacing quartz, however, the felspar crystals have not determined any special orientation in the case of the tourmaline. In the slide in which replacing quartz is absent the original quartz grains do not seem to have entirely escaped change. They appear to be corroded around the edges, and to some extent replaced by tourmaline; this appearance is nearly absent from the slides, which contain secondary quartz.

One slide was prepared of greissen, occurring as a replacement of a granite or aplite, containing quartz tourmaline nodules. The rock consists of quartz, tourmaline, and a fibrous mica; the quartz appears for the most part in the form typical of the quartz of tourmaline granite, but there is in addition a small number of minute grains of quartz surrounded by a confused mesh of mica; the mica is in fibrous crystals, sometimes arranged with radial structure; it shows no pleochrism, but there is a considerable amount of absorption of light as the slide is rotated. It polarises in very high colours, and appears to have the optical properties of muscovite. Tourmaline occurs in small quantities as hypidiomorphic pleochroic crystals, but it is not present in the form of rods in the quartz grains. The mica would appear to be for the most part a replacement after felspar, but the occurrence of small nests and meshes of mica in the larger grains of quartz shows that the latter mineral has also suffered replacement. In the slide are a few very minute crystals of a highly refractory substance, which may be zircon; the material of the slide surrounding these specks is frequently coloured brown. One slide was prepared of quartz tourmaline rock, replacing slate which appears originally to have possessed a finely laminated structure. The laminæ have been for the most part replaced by grains of pleochroic tourmaline arranged linearly, and are separated from each other by minute grains of clear quartz.

The vein stone was not examined microscopically. It often consists almost wholly of tourmaline, but is sometimes very rich in tin oxide. The tourmaline often occurs in large bunches of radiating prisms or needles going up to 6 or 8 inches in length. Occasionally, however, a good deal of quartz is present, and this is especially the case where the veins traverse the sedimentary rocks. The tourmaline appears to gradually decrease as the distance from the granite increases, until finally only quartz veins are to be seen. With the disappearance of the tourmaline, disappears also the metamorphism of the wall rock, which is so characteristic of the veins, both in the granite and in its immediate vicinity.

Quartz-tourmaline Dykes.

These interesting dykes were, we believe, first observed by Mr. F. J. Ernst. They are found traversing both the granite and the sedimentary rocks, and are distinguished from the veins by the fact that their structure is not dependent upon the character of the wall rock, since they traverse granites, aplites, and sedimentary rocks without undergoing change. They have no central fissure, and the walls are generally sharp and clear-cut, even more so than the aplite dykes. They are usually of uniform composition throughout, consisting of a somewhat finely granular mixture of quartz and tourmaline, with sometimes a little felspar. When they traverse sedimentary rocks, they often contain included angular fragments of the country-rock. In the slides of this rock which were prepared the only minerals observed were quartz and tourmaline. The former mineral occurs as irregular grains, containing a very small amount of minute opaque specks. Tourmaline is present in well-formed crystals of prismatic habit, as grains, and as clusters of grains and crystals. The larger crystals of prismatic habit have a marked pleochroism, but as the crystals dwindle in size the pleochroism gradually diminishes, and cannot be detected in the smallest crystals. The tourmaline has preceded the quartz in order of crystallisation; radiating prisms of small size frequently penetrate the quartz grains, the centre of radiation being often one of the larger tourmaline crystals. The tourmaline rods previously alluded to are quite absent from the quartz of this rock.

In many cases the wall rock of the dykes has suffered metamorphism in a similar manner to that of the tourmaline veins, but to a lesser extent. In several instances, where the dykes occurred in granite, it was observed that the latter had been converted into quartz-rock or quartz-tourmaline rock, for a short distance (generally not more than a few inches) on either side of the dyke. In other cases, even along the same dyke, the wall rock had remained apparently unaltered. It is conceivable that this metamorphism may have been produced by vapours which traversed the fissure, prior to the introduction of the quartz-tourmaline magma, but it seems more probable that it was caused by emanations from the dyke-rock itself.

Two interesting instances of variation in composition were noted in the dykes traversing the Silurian strata at the Gentle Annie Rise, to the east of Mount Heemskirk. In one case of a dyke 2½ inches in width, a portion of the tourmaline had segregated towards the centre of the dyke and formed a central seam about ¾ inch in width, the remainder of the dyke being composed of the normal quartz-tourmaline mixture. In another case of a somewhat larger dyke, the quartz had segregated, and for a foot or fifteen inches the dyke channel was filled with white quartz almost free from tourmaline. The latter instance seems to point to the fact that the quartz-tourmaline dykes may change to quartz veins as well as the quartz tourmaline veins.

Several observations were made at the Gentle Annie Rise of small quartz and quartz-tourmaline veins being cut through or faulted by quartz-tourmaline dykes. These observations are perhaps not yet sufficiently numerous to establish the relative ages of the two kinds of reefs definitely, but it may be said, that in some cases at least, the dykes are younger than the veins. This conclusion is of great importance, for it proves that the quartz and quartz-tourmaline veins were formed before the close of the period of eruptive action of the granite.

Conclusions.

We may now state briefly the conclusions which we think are justified by the facts which were observed in this district with regard to the origin of these tourmaline rocks and the associated tin-bearing veins.

It appears perfectly evident that the tourmaline is an original constitutent of the granite magma, since in one form or another it is contained in all the rocks which have been examined. There appears, however, to have been a continued tendency for the tourmaline to segregate together and separate itself from the rest of the magma. In the normal granite, it occurs only in microscopic rods in some of the quartz, and must represent an extremely small percentage of the total composition of the rock. But even here there is a tendency for the tourmaline to come together and form minute bundles of interlacing or radiating rods. In the tourmaline granites, the tourmaline is much more abundant, and forms macroscopic bundles of radiating needles, and even granular nodules of quartz and tourmaline. This great increase in the amount of tourmaline present is, we believe, to be accounted for by some process of differentiation or segregation in the original granite magma, while the presence of tourmaline in separate bundles and nodules may be accounted for by a further process of magmatic segregation from the already differentiated tourmaline-bearing magma. The tourmaline-aplite magma may have separated from the tourmaline-granite magma in the same way as the tourmaline-granite magma separated from the normal granite magma. The presence of irregular masses of tourmaline-granite in the normal granite, and of tourmaline-aplite in tourmaline-granite, is we think, convincing evidence that the three types of rock have originated from one and the same magma, and that the differentiation has taken place before, and not after, the consolidation of the magma. A definite order of consolidation of the three rocks may be observed. Dykes of tourmaline-granite occur in the normal granite, but not in the tourmaline-aplite, while dykes of tourmaline-aplite occur both in the tourmaline-granite and in the normal granite. It is evident therefore that the order of consolidation was (1) normal granite, (2) tourmaline-granite, (3) tourmaline-aplite.

The composition of the quartz-tourmaline nodules at once suggests that the quartz-tourmaline reefs are in some way connected with these. In many places the nodules appear to have a tendency to come together and unite to form larger masses of quartz-tourmaline rock. At greater depths, where the cooling of the magma would proceed more slowly, this might well take place, and the quartz-tourmaline magma thus formed might be the origin of the quartz-tourmaline dykes. The presence of the veins, however, suggests that a further separation first takes place within the quartz-tourmaline magma, namely, a separation into a highly aqueous and a less aqueous magma. The former would be virtually a saturated solution, and in this would be concentrated the heavy metals originally contained in the magma, since, from the common occurrence of these metals in mineral veins, we know them to be specially soluble in heated waters. Assuming, now, that such masses of quartz-tourmaline magma were intersected by fissures formed by the contraction of the granite in cooling, the more highly aqueous portion, being the more fluid, would be first erupted, and owing to its highly-heated condition and the presence of such powerful mineralising agents as boron, fluorine (both of these are present in tourmaline), hydrogen sulphide and water would have a very powerful chemical action on the wall of the fissures, producing the complete metamorphism of the wall rock, which has already been described. The more viscous quartz-tourmaline magma might be erupted later and form quartz-tourmaline dykes.

It will be remembered that the quartz-tourmaline veins traverse both the normal granite and the tourmaline granite and aplites, while in several instances the quartz-tourmaline dykes were observed to fault the quartz-tourmaline veins. The relative ages of all of the tourmaline-bearing rocks, described in this paper appear therefore to be as follows,—(1) normal granite, (2) tourmaline-granite, (3) tourmaline-aplite, (4) quartz-tourmaline veins, (5) quartz-tourmaline dykes.

A GEOLOGICAL EXCURSION TO PORT CYGNET IN CONNECTION WITH THE AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, 1902.

By W. H. Twelvetrees.

The interest attaching to the plexus of felspathoid rocks, now known to occur at Port Cygnet, led to a flying visit being paid to the locality by members of Section C. (Geology) of the Australasian Association for the Advancement of Science, in January, 1902. The occurrence of this division of eruptive rocks in Tasmania is so restricted, and their development is exposed so instructively, that a brief account of the excursion will be interesting to others besides the actual visitors.

Seventeen members took advantage of the opportunity, and travelled to Port Cygnet by one of the Channel steamers, making the trip in a few hours. A call was made at Kettering, in the D'Entrecasteaux Channel, where Professor E. C. Hogg led the party to an exposure of Permo-Carboniferous till, with glaciated pebbles. Oyster Cove, where the belt of alkali rocks comes through from Port Cygnet, was not visited, the entire energies of the expedition being reserved for the better known area at Lovett. Elæolite syenite, essexite and alkali rocks with trachytoidal groundmass, occur at Oyster Cove.

The assistance rendered to the cause of Science by the Hon. Edward Mulcahy, the then Minister of Lands, Works, and Mines, in lending the services of the two State geologists, was appreciated by the members and duly acknowledged at the time. Despite the short time at the disposal of some of the professors, who had to return to Hobart to attend a meeting of Council, the area examined was considerable, the only regret being that members could not linger a few days longer at a spot which it was recognised must eventually become one of classic interest to petrographers.

As the steamer drew near to the jetty at the head of the arm of the Huon, known as Port Cygnet, about a mile south of the township of Lovett, the scene was owned to be highly picturesque. Wooded heights ascend from the water's edge on each side, and large fruit orchards diversify the aspect of the slopes. The view eastwards is shut in by the high range in the background, a ridge of Mesozoic diabase (dolerite), the holocrystalline plagioclase-augite rock, which R. M. Johnston shows, is prolonged southwards from Mt. Wellington and apparently forms the axis of the peninsula which divides the waters of Port Cygnet from the Channel. This high ridge is flanked by Permo-Carboniferous sandstone and mudstone on either side, and, according to F. J. Ernst, crosses the zone of alkali rocks in their N.E.-S.W. course. Westwards the same Permo-Carboniferous beds are found, also broken through by the elæolite syenites, tinguaites and allied rocks, which the members of the Section now hastened to examine *in sitû*.

At the extreme head of the arm the water is shallow, and old residents say that it has receded considerably in recent years. The shores are flat, and no good exposures of rock are visible. The first outcrop of the alkali rocks is seen on the shore, between the two jetties, but a more striking development occurs at, and immediately south of, the Regatta ground. This point, the termination of a projecting headland a few hundred feet wide, consists of elæolite-syenite with varieties of alkali and alkali-quartz, syenite passing at each margin into darker varieties, which have been determined by Professor H. Rosenbusch, to whom samples were submitted by the Mines Department, as jacupirangite, essexite, and nephelinite (or monchiquite). Generally speaking, there are no sharp divisions between the central mass of light-coloured syenite and the dark marginal rocks, though well-defined bands and veins of the lighter rock traverse the other, sometimes in such profusion as to form a meshwork. At other times the most gradual variation is seen from one to the other, the lighter variety growing darker by imperceptible stages. The darker rocks also vary considerably, both in texture and colour. It is impossible to resist the conclusion that we are here in the presence of an example of magmatic differentiation. The leucocratic centre is elæolite-syenite, and the dark marginal rocks are differentiated products. Of the latter, the mica nephelinite (containing large crystals of biotite) has only been found as scattered stones, but a little excavation work would probably reveal the bed-rock. The locality is between the Regatta Box and the Point. Professor Rosenbusch says this rock is nephelinite with the habit of a monchiquite, to some extent actually a monchiquite with a groundmass of nepheline, instead of analcime or glass. Monchiquite is usually considered to be a rock composed of the dark silicates in a groundmass of analcime. Some authors affirm the analcime to be Primary, others believe it may be the hydration product of original glass.

The essexite of the Regatta ground is a dark dioritic-looking rock found at the water's edge below the Regatta Box. I have also seen it at Oyster Cove. It consists of labradorite and andesine felspars + augite + amphibole with quartz and iron oxide. Although it possesses the characteristics of its family, it differs, according to Professor Rosenbusch, in type from other essexites known to him, and requires further study.

The jacupirangite (nepheline + augite) is not always so intensely pyroxenic as typical specimens from Jacupiranga. Professor Rosenbusch has, with his usual kindness, furnished me with the following note upon it.

" It is a highly pyroxenic differentiation of the elæolite and alkali syenites at the Regatta ground, Port Cygnet, and possesses the characters of the so-called jacupirangite of San Paulo, in Brazil, and of Alnö, in Sweden. It would be rather interesting to examine the sand of any adjacent creeks which may flow over the syenites with this jacupirangite facies. The interesting mineral, Baddeleyite ($Zr\,O_2$) may be expected to occur."

Further south from this promontory a few dykes were visited on the shore of the Arm, traversing mudstones of Permo-Carboniferous age. One is a green sölvsbergite porphyry, its colour due to aegirine. It contains parallel layers of porphyritic tabular crystals of sanidine. Another dyke, a little further south, contains the new variety of garnet, Johnstonotite. It is a mica sölvsbergite. Professor Rosenbusch calls attention to an undetermined mineral which he has observed in it. He says.—

" This rock contains in small quantities, but widely distributed, a strongly refractive, red, transparent, isotropic mineral, which I have noticed in many other rocks of the alkali series, but which I have not been able to determine yet. I suspect that it belongs to the pyrochlore group."

The next day the party visited Mount Livingstone, one mile N.E. of Lovett, where large collections were made of the beautiful elaeolite syenite porphyry, which seems to form the axis of the hill, and can be gathered in loose blocks on the crest. These rocks had been previously designated phonolitic trachyte and nosean or hauyne trachyte by the writer, but Professor Rosenbusch has identified them as elaeolite syenite porphyries with trachytoid groundmass. He has taken the trouble to accompany his identification with the following remarks. Speaking of the porphyry with the large biscuit-like felspar crystals ("magpie" locally), he says:—

"Large crystals of orthoclase with splendid cleavage parallel to P (001), M (010), and ($\bar{1}01$), a little triclinic felspar, a few pseudomorphs of natrolite after nepheline, pseudomorphs of iron ores after nosean and biotite (?) and some garnets lie in a very fine fluidal trachytic groundmass of felspars The pseudomorphs after nepheline are the most charming aggregates of natrolite that I have ever seen, except in the tinguaites from Alnö. At the same time it is also possible that the original mineral was sodalite. These pseudomorphs are also enclosed in the felspars. The rock is strongly impregnated with pyrite. I hesitate only whether to call it an alkali syenite porphyry or on elæolite syenite porphyry."

The pseudomorphs of iron ore after nosean have been a puzzling question for some time, and I sent a slide to Professor Rosenbusch containing a section of one of them plainly replacing garnet, and suggested that garnet may have been the original mineral in all instances. The Professor's reply shows an openness of mind which is refreshing to meet with now-a-days. It is as follows:—

"I agree with you in referring the iron ore pseudomorphs in the slide which you sent me to garnet (melanite). At the same time, I am not sure whether this holds good for the pseupomorphs in my slides. It may possibly do so. The difference in habit may be due to varying thickness of the slices. In my slices the forms remind me of nosean in leucitophyres and allied rocks. Had I seen your slide first, perhaps my interpretation would not have occurred to me."

It may, therefore, well be that some of these iron ore pseudomorphs are really after nosean, while others replace garnet. From the fact that we have undoubted nepheline in in this group of rocks, it is likely that the matrolitic pseudomorphs are after nepheline.

Closely allied with the above is a fresh-looking garnetiferous porphyry of trachytic aspect, with glistening phenocrysts of sanidine, and spotted in places rather abundantly with small soft grey or white crystals of haüyne or nosean. Nosean trachyte or phonolite appeared a convenient name, but Professor Rosenbusch calls it a melanite-bearing elaeolite syenite porphyry. He writes:—

"The felspar is fresh and like sanidine. A few small elaeolites are converted for the most part into aggregates of natrolite. The dark constituent is an emphibole with $\mathfrak{c} : c = 20^\circ$ $\gamma - a$ weak, $\mathfrak{c} = b$ blue green, $\mathfrak{a}$ greenish yellow.

The garnet is fresh, zonally marked, highy idiomorphic, and occurs not only as phenocrysts, but also as a constituent of the trachytoid groundmass."

The nosean mineral, though plentiful in many specimens of the rock, is rare in others, and is sometimes quite absent. A suggestion was made to me in Victoria that the identification of the nosean might be incorrect. I felt satisfied that no mistake had been made, and Professor David, to whom I showed a slide, confirmed the reference. Professor Rosenbusch also recognised nosean, or haüyne, in a slide which was sent to him. He says:—

"Whether haüyne (rich in Ca) or nosean (rich in Na) is present cannot be determined without chemical investigation, but one of these two minerals is undoubtedly here."

I do not know that nosean or haüyne has been recorded elsewhere in Australasia.

Mount Mary is situate to the west of Lovett, and a trip made to it disclosed the occurrence of other members of the alkali series. The elaeolite, or alkali syenite porphyry, with the biscuit-like felspar phenocrysts, was seen at the Mount Mary mine, and a little above it the hillside was strewn with stones of green tinguaite, or fluidal tinguaite porphyry. The summit is occupied by a grey tinguaite porphyry, with large glassy sanidine felspars, and rich in fresh-looking melanite, but poor in nepheline. It occurs in contact with Permo-Carboniferous sediments, impregnated with pyrites. Near the summit are outcrops of the alkali syenite intrusion, which apparently forms the mass of the mountains.

On the Back Road the plutonic rock is well exposed. With respect to this Professor Rosenbusch writes:—

"It consists of dull orthoclase, fresh and beautifully zoned albitic felspar, with basic margins; augite ($\mathfrak{c} : c = 48^\circ$) green in colour, with occasional narrow margins of deeper tint passing over into aegirine augite. The rock belongs to the alkali augite syenites, though it does not agree with either Pulaskite, Nordmarkite, Umptekite, or Laurvikite, &c.; in fact, it does not correspond exactly with any of the numerous rocks of that series. According to its dominant structure, I would call it either an alkali syenite with porphyritic facies, or an alkali syenite porphyry with granular facies."

The visit of the members of Section C. to Port Cygnet has proved of double value to the cause of geological science, inasmuch as it has led to the above remarks from this great German master of petrology.

These intrusive rocks carry pyrites, and along the lines of their contact with the Permo-Carboniferous sedimentary strata some silicification has taken place, accompanied by a concentration of pyrite. Some of the contact stone assays 5 to 6 ozs. silver and from ½dwt. to 2 or 3 dwts. gold per ton. The district has yielded about 3000 ozs. alluvial gold, most of which was derived from the small flats near Lymington.

The variations which distinguish the Port Cygnet rocks from alkali rocks elsewhere may be appealed to in illustration of the theory of petrological provinces. They cannot be exactly correlated with the known members of the series elsewhere, and possibly new names may be required for some of them.

The study of the group is not complete, and as it progresses readjustment of the nomenclature are inevitable, but at present the series would be arranged as follows:—

ALKALI ROCKS.

Family 1.—ALKALI GRANITE.

Not represented.

Family 2.—ALKALI SYENITE.

(*a*) Plutonic representatives:—

1. Quartz augite syenite: a medium-grained, yellowish rock at Regatta Point (alkali felspar + augite + quartz).
2. Alkali syenite at Regatta Point and on Back Road (orthoclase and albitic felspar + augite + amphibole with accessory biotite, quartz, sphene, and apatite). Has frequently a porphyritic facies.

Family 3. ELAEOLITE SYENITE.

(*a*) Plutonic representatives:—

1. Elaeolite syenite: coarse syenite rock at Regatta Point, and near top of Mount Mary (alkali felspar + elaeolite + alkaline pyroxene + amphibole). Contains melanite and biotite, also hydronephelite after elaeolite [or sodalite], and accessory sphene and apatite.

(*b*) Complementary and dyke representatives:—

1. Elaeolite Syenite porphyry, viz—
   (i.) The biscuit felspar rock on Mount Livingstone and Mount Mary ("Magpie") [orthoclase and a little triclinic felspar + alkaline pyroxene and amphibole + melanite and iron ore pseudomorphs after nosean and garnet with natrolitic pseudomorphs after nepheline (or sodalite)]. Has a fluidal felspathic groundmass.

(ii.) The nosean rock on Mount Livingstone, closely related to the preceding. (Sanidine + amphibole + alkaline pyroxene + melanite + nosean or haüyne. Aggregates of natrolite after small crystals of nepheline.

2. Mica sölvsbergite. Dyke on beach one mile south of Regatta Point: (orthoclase and albite felspars + brownish yellow mica + garnet + a pyrochlore mineral (?).
3. Sölvsbergite porphyry . a little north of the preceding. (Phenocrysts = sanidine + aegirine and natrolite after aegirine Groundmass = acicular aegirine + sanidine + analcime and a little nepheline.
4. Tinguaite porphyry: On Mount Mary (Phenocrysts = aegirine augite + melanite + sanidine + sphene + nepheline. Groundmass = sanidine + acicular aegirine + analcime
5. Jacupirangite: at Regatta Point (nepheline + augite.)

Family 4.—ESSEXITE.

(*a*.) Plutonic representatives.

1. Essexite, dark, dioritic-looking rock below the Regatta Box (Labradorite and andesine felspar + augite + amphibole + quartz).

Family 5.—THERALITE.

(*a*.) Plutonic representatives absent.

(*b*.) Complementary and dyke representatives: —

1. Mica nephelinite. At Regatta Point (Nepheline + augite + biotite + amphibole and accessory apatite. Has the habit of a monchiquite.

Family 6.—IJOLITE.

This is not represented, unless with H. Stanley Jevons[*] we detach jacupirangite from the elaeolite syenite family and place it among the felsparless ijolites. Its tendency to variation in mineral constitution and its usual intimate association with elaeolite syenite incline me to retain it as a differentiation of that magma.

The alkali rocks are also found in other parts of Tasmania, and to make their enumerations complete I cite the additional localties, viz:—

Family 4.—ESSEXITE.

(*c*) Effusive representatives: —

1. Trachydolerite: the bluffs at Table Cape and Circular Head (labradorite + augite + olivine, with analcime and apatite (and nepheline?).
2. Melilite basalt: on the Shannon Tier, at Sandy Bay, and near Rokeby (melilite + olivine (sometimes as fayalite) + augite + perofskite.

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[*] A systematic nomenclature for igneous rocks. H. S. Jevons, M.A., Geol. Mag. 1901, p. 304.

Family 5.—THERALITE.

(*c*) Effusive representatives :—

1. Nephelinite : on the Shannon Tier (nepheline + augite).
2. Limburgite : a dyke on the Emu Bay railway, near Burnie (olivine + augite).

The alkali rocks form one of the two primary divisions of the eruptives. One division is that comprising granites, syenites, diorites, gabbro, and the ultra basics : the other comprises the alkali eruptives. The latter, though not so universally abundant as the former, illustrate a remarkable aptitude for differentiation in the alkaline magma : hence numerous variations from typical forms and increasing additions to the nomenclature. The occurrences of Tasmanian rocks belonging to this division are consequently of distinct interest to both the petrographer and the geologist.

TASMANIA.

REPORT

OF THE

SECRETARY FOR MINES

FOR

HALF-YEAR ENDING DECEMBER 31

1903

Including Reports of the Commissioners of Mines, Inspectors
of Mines, Government Geologist, Assistant Government
Geologist, Mount Cameron Water-Race
Board, &c.

Tasmania.
JOHN VAIL, GOVERNMENT PRINTER, HOBART.

1904.

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REPORT OF THE SECRETARY FOR MINES.

Mines Department, Hobart,
30th June, 1904.

SIR,

I HAVE the honour to submit my Report upon the Mines Department and the progress of the Mining Industry for the half-year ending 31st December, 1903.

The termination of the financial year having been altered from the 31st December to the 30th June in every year, has rendered it necessary for a report to be furnished for six months only.

GENERAL REMARKS.

Although the output and value of minerals has been fairly well maintained during the period under review, the time has arrived when something should be done to foster and encourage the industry, and I am glad to find that a Bill is being drafted upon the lines suggested in my Report for the year ending 30th June, 1901, providing for the payment of a monetary reward for the discovery of a payable mining field, such reward to be regulated upon a population basis.

Provision will, I understand, also be made for granting of special leases, entirely eliminating all labour covenants, upon payment of an increased rental. It is thought that this will be an inducement for capitalists to invest their money in Tasmanian mines, the present insecurity of tenure being a bar to the introduction of capital for the development of some of our mines.

The Northern, North-eastern, and Eastern Mining Districts have been amalgamated, and the services of two old and valuable officers have been dispensed with. Great dissatisfaction throughout the districts has been expressed, and great inconvenience to the Department has been experienced through the retrenchment of the Commissioners referred to. The district is, I consider, too extensive for one Commissioner. I do not wish to say anything disparaging of the Commissioner in charge; he is an excellent officer, and thoroughly competent to perform the combined duties of Stipendiary Magistrate and Commissioner of Mines, but a Resident Commissioner, who can at all times be interviewed by the mining public desirous of obtaining information, is essential for the advancement of the mining industry, and would prevent disputes and litigation.

APPENDICES.

Appended will be found the following Reports and Papers:—

- Annual Report of the Mount Cameron Water-race Board.
- Report of the Government Geologist.
- Report of the Chief Inspector of Mines.
- Reports of the Inspectors of Mines.
- Reports of the Commissioners of Mines.

Papers by—

- W. H. Twelvetrees, Esq., F.G.S.—Notes on Jacupirangite in Tasmania.
- W. F. Petterd, Esq.—Notes on Tasmanian Minerals.

GOLD MINING.

Beaconsfield.—Not more than 400 men were employed in the district this half-year, principally owing to reduction of hands at the Tasmania Mine, pending the initiation of work on full scale by the English company which has lately come into possession of that property. Additional pumping-plant has been decided upon; the deep shaft is being enlarged to receive the first unit of pumps, and the main shaft is to be further deepened for the extraction of quartz. Since this mine was first begun, it has yielded 507,661 tons of quartz, which have returned (by amalgamation and chlorination) 579,694 ozs. 8 dwts. 17 grs. gold. Owing to the influx of water at the 1000-feet level in 1902, the total amount distributed in dividends has remained stationary since the close of that year. The total sum paid in dividends is £772,071 15s.

During the present period of comparative inaction of the big mine, the other mines in this field have not received much attention. The Moonlight-cum-Wonder Mine has suspended operations for the present. The Bonanza Proprietary has sunk to 390 feet, and is still confident of ultimately reaching the Tasmania reef. At the Tasman Ophir Mine work has proceeded in the body of wash at the 200 and 400-feet levels; but some difficulty has been experienced in the gold-extraction, and expert advice is being sought before further continuing operations. A little work has been carried on at the North Tasmania, New Tasmania United, King Victor, &c.

At the Blue Tier, the Salisbury and Duchess of York mines have been dormant; while efforts, so far unsuccessful, have been made to introduce fresh capital into them. A good quantity of gold was formerly won from the Tier, but its distribution is somewhat irregular, and deeper work is a desideratum.

Lefroy.—The New Pinafore is still the principal company operating on this field. A little gold was won from the workings on the old Point and Crown property, and the company has been driving on that reef, with irregular results; exploratory cross-cutting is going on towards parallel reefs (Richards and Bain's and the Hit or Miss reefs). This mine has in the past distributed £71,500 in dividends. The old Volunteer Mine has been taken up by the Digney and Casey Syndicate, who are working left ground above the 300-feet level, with profitable results. A few prospecting parties are at work on the field, which, despite its present languishing state, deserves as much attention as ever it did.

Mathinna.—A decided revival has taken place on this field, and more prospecting and exploratory work has been going on than for a long time past. At the end of the year, 90 heads of stamps were working in the district, which is an increase of 50 heads within the last two years, and 40 heads within the last twelve months.

At the New Golden Gate, profitable stone has been disclosed south of the main slide, in successive shoots, between faults, and the prospects are considered assured for a long time to come. An electric pumping-plant is about to be installed at the mine by Messrs. Siemens. The total quantity of quartz crushed since the inception of the company is 229,871 tons, which yielded 198,818 ounces of gold, realising £758,377 17s. 9d. Dividends have been paid amounting to £334,400.

Operations at other mines in the neighbourhood are being pushed forward. The Tasmanian Consols, an English company, has sunk its main shaft to 1300 feet, and struck gold-bearing stone at both the 1200 and 1300-feet levels. The Volunteer Consolidated has also found rich quartz at the 450 feet. Stevens and party have made a sensational discovery on the old Pride of Mathinna ground, south of and adjoining the New Golden Gate. Exceedingly rich stone is being worked by them, from the surface down, on a reef about 1 foot wide.

The New Golden King has been crushing 9-dwt. stone, which would pay if it were less erratic and the country not so hard; exploration work is to be continued to the western boundary.

North of Mathinna, prospecting has been going on in the South Mt. Victoria field. Reefs on the old Una properties have been opened into; some work has been done at the Hinemoa, a new mine opened with New Zealand capital. The Carnegie and King Edward mines have been worked on a small scale. In the near future it is anticipated that English capital will be brought in to revive the Havelock, a mine which, compelled to leave off on account of the water, raised very fair-quality stone. The O'Brien, Laranda, Starlight, Stricklands, are other quiescent mines on this field, all deserving further attention. The works in all of them are shallow; and the field is untested in depth. It is an important field, as it is the extension of the Mathinna country, and is composed of the same auriferous series of slates and sandstones. The registered produce of the Mathinna field for the six months was 8585 ozs. gold.

Mangana, &c.—Work has not been very productive here during the period under review; only 1570 tons of quartz being crushed, and 57 ozs. gold obtained. After a disappointing crushing at Abbotsford Creek, the company relinquished work; but others are extending the low-level, in order to explore the reef at that depth.

Mt. Victoria.—The Long Struggle Mine has continued to raise payable stone. The Ringarooma Company is about to dispose of the New Mercury portion of its property to a private syndicate. The gold-bearing strata here are the northern prolongations of those at South Mt. Victoria and Mathinna.

Golconda and Panama.—A few syndicates have carried on exploratory and developmental work. The New Enterprise owners are testing the old mine, by sinking into the untried reef below water-level.

Lyndhurst.—Desultory work has proceeded, and hopes are entertained of a permanent revival of this old field.

The Lisle Dredging Company.—This company has produced 356 ozs. gold during the six months.

West Coast.—Work has been prosecuted actively at the Coronation Mine, a shaft being sunk 42 feet, and the lode driven on for upwards of 100 feet, carrying payable gold. A 5-head battery has been obtained, but the transport of machinery to the mine is difficult.

At the Mt. Ellen Gold Mine a good deal of material has been broken, but the results have not been quite satisfactory.

Prospecting has been proceeding on Flannigan's Flat, Woody Hill, the Queen River, and on Mt. Darwin.

SILVER MINING.

In the silver-lead mining district of Zeehan and neighbourhood, operations have resulted in an increased output as compared with the previous year. Among the noteworthy events of the period are the re-starting of the Queen and Western mines. The British Zeehan and the Zeehan Montana mines have been large contributors to the production of the field, the Spray lode of the former mine having proved highly satisfactory. The Oonah has been worked on tribute, and it is believed that the property, if judiciously developed, could be made to be still more productive. These three mines have been the main producers of ore at Zeehan; but, with the addition of the Queen, Western, and Florence, a considerable augmentation of output is anticipated.

Dundas.—Work at the Comet Mine has proceeded vigorously, and the output of ore has increased. The West Comet, too, has been a productive mine, and arrived at a dividend-paying stage at the end of the year.

Mount Read.—The Hercules has continued to mine its large deposit of mixed ores of comparatively low-grade, much of which is sent to the Tasmanian Smelting Co., to be profitably dealt with at Zeehan. The balance of the output is shipped to N.S. Wales. The company has declared a dividend of sixpence per share during the half-year. A discovery of high-grade zinc ore was made in the No. 4 tunnel. At first the deposit was thought to be small, but upon extraction for the market, fresh reserves were disclosed; and there are actually several thousand tons in sight. This deposit is rich enough in zinc contents for the greater portion to be sold as zinc ore for export to Europe. The Ring Valley, South, and South-west Curtin Davis mines have also been producers.

Tasmanian Smelting Company.—The operations of this company are, to a great extent, an index of the state of mining in the Zeehan, Dundas, and Farrell districts. As production has been on the up-grade, the smelters have received their share of the increase; this is apparent in their statistics, which show a great improvement on the previous year. During the half-year $13.334\frac{6}{10}$ tons of ore were purchased and smelted.

Magnet.—The Magnet Mine has been steadily developed, and brought on the dividend-list; one dividend of a shilling per share was declared during the half-year. The half-year's shipments consisted of 5746 tons of silver-lead ore, value £14,480 14s. 7d. A deeper level is being opened out 60 feet below No. 4, upon a good lode going very strong under foot; so that the next level may also be expected to prove as valuable as this. It is proposed to erect a concentrating mill, in order to treat the accumulating milling-ore, and to maintain an even grade output.

Heazlewood and Whyte Rivers.—Prospecting and developmental work has been continued at the Long Tunnel, Confidence, Washington Hay, Victorian Magnet, and Godkin Amalgamated mines with more or less success. The district is essentially a mineral one, and the known deposits and indications fully warrant more outlay upon their development.

Mount Farrell.—The North Mt. Farrell, Mackintosh, and Murchison River mines have been active; but work in the district has been checked by a lock-out at the North Farrell Mine. When things are settled, the field bids fair to become an important mining centre.

The Devon Mine, on the Dove River, has resumed work; its silver-lead lode is being tested by a small association.

COPPER.

Mount Lyell.—The amalgamation of the Mt. Lyell and the North Lyell companies has furnished important additions to the furnace supplies. Besides the higher-grade of the North Lyell ore, the ores from the two mines are mutually complementary, which has permitted great reductions to be made in the cost of producing blister-copper. During the half-year, the company smelted 178,700 tons of ore, producing 3750 tons of blister copper, which contained 3706 tons of copper, valued at £223,019 0s. 11d.; 364,288 ozs. of silver (fine), valued at £39,973 14s. 6d.; and 10,280 ozs. of gold (fine), valued at £43,690; being a total value of £306,682 15s. 5d.

At the Mt. Lyell Blocks Mine, opening up and equipping work has been pushed on with. Plant is to be installed for treating the extensive deposit of copper-bearing clay which this company is exploring. Prospecting work has gone forward on a few other mines of this field, viz., Tasman and Crown Lyell Extended, Crown Lyell, Mt. Lyell Comstock, and Tasman-Comstock mines.

Jukes and Darwin.—Work here has been continued, but without very decided results. This field is in an embryonic state so far: it has large deposits of low-grade ore, and small deposits of high-grade. It is hoped that it may yet be possible to utilise some of these.

Rosebery.—Tribute work on the Primrose Mine is being carried on in the gossanous parts of the copper-zinc-lead sulphide lode. The gold and silver contents of the ore are looked upon as making the proposition a payable one

Heazlewood.—The Wealth of Tasmania Proprietary is developing a copper mine in a small but rich deposit of copper ore. The workable part of the deposit is not yet located satisfactorily.

North-West Coast.—Some copper ore deposits in the Blythe and Stowport districts have come to the front recently. The Rutherford Syndicate, near Burnie, has opened out on a lode which, in its oxidised upper part, gives favourable assay returns; it is to be vigorously developed. Other deposits exist in the neighbourhood, and will now probably receive attention, as there is no doubt that this belt of country is a copper-bearing one. The district is mainly agricultural, and has been very imperfectly tested for ore deposits. It may yet become as esteemed for its mineral wealth as it is for its farm lands.

TIN.

East Coast.—Owing to the unusually wet season, the supply of water has been abundant; and this circumstance, in conjunction with favourable market rates, has produced considerable activity throughout the tin districts.

Derby.—The Briseis Mine obtained 216 tons during the general work of removing the overburden. This preliminary stripping work is deemed necessary before ore-raising is begun regularly on the scale contemplated by the company.

The Ringarooma Company has explored its ground by means of bores, and is temporarily closed down, pending the consideration and adoption of a more economical scheme of work.

The Arba produced 46 tons; and the neighbouring property is also being tested.

The Ruby Flat, Star of Peace, and other claims have done well. The Mammoth Company, adjoining the Star of Peace, is erecting a battery.

Moorina.—The Native Youth, Moorina Tin, Weld, and Moa mines have produced fair quantities of ore.

The Pioneer Tin-mining Company, Limited, at Bradshaw's Creek, has pumped and sluiced during the half-year 157,900 cubic yards of drift, for a yield of 192 tons of stream tin. During this period dividends for £10,300 were declared, making a total of £32,175.

The small claims at the Wyniford River have had profitable yields, as also the Ruby claims at South Mount Cameron.

Gladstone.—A good deal of preparatory work was done on the Scotia, but in the last quarter the mine returned 19 tons of ore, and will be a larger producer in future. Owing to the high market price of tin, the Gladstone drifts are receiving more attention from capitalists, and extensive prospecting is impending.

Weldborough and Blue Tier.—Mining at Weldborough has proceeded as usual with regularly fair results. In the Blue Tier district the Anchor Mine, at Lottah, produced 116 tons of tin ore. Alterations in the scheme of working have been made, and richer stone made available lately. Attempts have been made to induce capitalists to undertake a programme for turning the extensive tin-bearing ground at the summit of the Blue Tier to profitable account.

St. Helens.—The mines here have contributed their share to the tin output of the Coast.

Mount Rex Mine.—The production for the half-year has been 86½ tons of tin ore, which is disposed of in England at satisfactory prices. The stone is not so rich in tin as it was before, but exploratory work is being extended to the north-west, with encouraging indications.

South Esk Mine.—No further work has been done on the lode formation, but the alluvial ground has given payable results.

North-West Coast—Waratah.—The Mount Bischoff Mine continues to be our largest producer. The tin ore obtained here during the six months amounted to 636 tons, which brings the total production since the formation of the Company to 62,230 tons 18 cwts. 2 qrs. 2 lbs. The Company declared dividends of £27,000 during the last half-year, making a total of £1,912,000 distributed amongst the shareholders. Ground has been worked at the Badger, near Waratah, mostly alluvial or surface, the prospects in the granite not being sufficiently alluring to induce underground mining.

West Coast.—Mayne's Tin Mine produced 20 tons; other claims in that district 19 tons. Working parties have been prospecting on and around Heemskirk. Attempts are being made to get capital into the Federation and Bullen's old mine. and it is hoped that there will be a revival of activity here.

Rich alluvial and lode deposits of tin ore have been discovered in the Stanley River district, extending in a long north and south belt. These are about to be taken in hand and developed on a considerable scale.

COAL MINING.

The two principal collieries are still the Cornwall and Mount Nicholas. In the Mersey field, Teasdale has opened a new mine on the Dulverton seam; and the Illamahta Mine is a new venture on the same seam. At the Marialva, Colebrook, work is going to be carried on more systematically than heretofore.

Good seams at Thompson's Marshes and near Mt. John cannot be utilised without tramway communication with the seaboard; and the same applies to the excellent coal at the Sandfly.

The first-class coal and kerosene shale at Preolenna is, unfortunately, for the present, too remote from transport facilities to be made use of.

IRON.

The Tasmanian Iron Company at Penguin raised 3550 tons of high-grade hematite, which was shipped to New South Wales smelters for fluxing purposes.

MINERAL PRODUCTS.

The following return shows the quantity and value of metals and minerals raised and exported during the six months ending 31st December, 1903: –

Minerals.	Quantity.	Value.
		£
Gold won .... ozs.	31,794·947*	135,072
Auriferous Quartz and Pyrites exported......... .... tons	311¼	9410
Silver ore .... exported tons	7169·14	77,270
Silver-lead Bullion ...... ,, ,,	3197½	103,861
Galena Ore .... ,, ,,	334¾	4643
Zinc Ore .... ,, ,,	1154	3536
Copper (Blister) .... ,, ,,	3508½	239,190
Copper .... ,, ,,	150½	11,288
Copper Ore .... ,, ,,	6¾	17
Tin Ore .... ,, ,,	183¾	5128
Tin (Metallic) .... ,, ,,	1202¾	154,271
Iron Ore .... ,, ,,	3528¾	2701
Ironstone Flux............ ,, ,,	50	100
Coal raised .... tons	23,961	20,739
Kaolin Ore .... ,,	4¾	14
Total	...	£767,240

* Fine gold, including gold contained in copper (blister) and silver-lead bullion.

The amount paid in dividends and bonuses was £136,580 17s.

GEOLOGICAL BRANCH.

During the half-year the Geologist and Assistant Geologist prepared reports upon mineral deposits at Preolenna, Long Plains and Heazlewood, the Dial Range, Sandfly, Mount Darwin, and Rosebery.

The Assistant Geologist has been engaged in the preparation of a report on the Zeehan mines, and a geological sketch-map of the field (to be published in colours, on a scale of 800 feet to the inch).

There were outstanding engagements at the end of the year for examination of the tin field at Stanley River, the silver-lead district of Mount Farrell, and the gold belt of Mathinna and Mount Victoria.

The quarterly progress reports of the Mineral Industry have been issued as usual. For these, as well as for the special district reports, there is considerable demand from abroad, and from visitors arriving in the State. Our publications, lying upon the tables of public libraries and institutes throughout the world, may be regarded as of distinct service in directing the attention of investors to the mineral resources of Tasmania.

INSPECTION OF MINES.

The three Inspectors have discharged their duties in the districts severally allotted to them. One Inspector was retired at the end of the year. The auxiliary inspection of mines by workmen is a matter under consideration. It is thought that its introduction would assist in reducing the dangers to which miners are exposed in their work.

DIAMOND-DRILLS.

The diamond-drills were not in operation during the period under review.

MOUNT CAMERON WATER RACE BOARD.

The Report of the Board is appended.

DEPARTMENTAL STAFF.

In consequence of the policy of retrenchment, the Hon. C. O'Reilly, Commissioner of Mines for the North-East Mining Division, stationed at Scottsdale, and Mr. E. H. Fowell, Commissioner of Mines for the Eastern Mining Division, stationed at St. Helens, were retired at the end of the year, but the change is not working out satisfactorily, as the amalgamation of the three divisions known as the North, the North-Eastern, and the Eastern, forms an area of such extent that it is practically impossible for the one Commissioner stationed at Launceston to keep in touch with the whole of it. Consequently great inconveniences arise, and much dissatisfaction is expressed at a system which involves the necessity of a journey to Launceston by anyone wishing to interview the Commissioner. The retired officers are both gentlemen of the highest integrity, and their duties were at all times performed in a creditable manner.

Mr. C. H. Curtain, Inspector of Mines, stationed at Queenstown, was also retired, but since the end of the year Mr. Geo. A. Waller, who assumed the duties of Inspector in addition to those of Geological Surveyor, has obtained an appointment in Queensland, and has left for that State, causing a vacancy which will require to be filled. It is proposed to re-appoint Mr. Curtain.

REVENUE.

The net revenue for the six months amounted to £14,758 17s. 1d. This amount does not include a sum of £1181 16s. 3d. deposited as survey-fees with applications for leases.

CONCLUSION.

In conclusion, I desire to thank W. H. Twelvetrees, Esq., and W. F. Petterd, Esq., for the papers contributed by them, also the several officers composing the Departmental Staff for the loyal and efficient manner in which they have performed their duties during the period under review.

I have the honor to be,
Sir,
Your very obedient Servant,

W. H. WALLACE, *Secretary for Mines.*

The Hon. CARMICHAEL LYNE, *Minister of Mines.*

DIAMOND-DRILLS.

Statement of Work done to 30th June, 1903.

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance Bored.	Average cost per foot, inclusive of Labour and Fuel.		
	No. 1 Drill.			feet.	£	s.	d.
1882-3	Back Creek—For Gold	Vertical	7	1330	0	10	9
1883	Lefroy—For Gold	Ditto	4	1011	0	5	3
1884	Tarleton—For Coal	Ditto	1	401	0	5	6
1886	Longford - For Coal	Ditto	2	1585	0	4	0½
1886-7	Harefield Estate—For Coal	Ditto	1	725	0	6	5
1887	Cardiff Claim, Mount Malcolm—For Coal	Ditto	1	562	0	17	11¾
1888	Killymoon Estate—For Coal	Ditto	1	504	0	4	7¾
1888-9	Seymour - For Coal	Ditto	5	2266	0	7	8½
1889 1890	Beaconsfield (Phœnix G.M. Co.) - For Gold	Ditto	1	781	2	0	2
1890	Beaconsfield (East Tasmania G.M. Co.)—For Gold	Ditto	1	978	0	14	9½
1891	Spring Bay—For Coal	Ditto	4	937	0	6	10
1891	Ravensdale—For Coal	Ditto	1	114	0	11	1½
1891-2	Back River, Prosser's Plains—For Coal	Ditto	2	854	0	6	1¾
1892-3	Lefroy (Deep Lead Syndicate)—For Gold	Ditto	4	979	0	15	9
1893	Lefroy (East Pinafore Co.)—For Gold	Ditto	1	317	0	10	3
1895-6	Sandfly—For Coal	Ditto	4	2130	0	11	5
1898 1900	Blue Tier (Anchor Co.)—For Tin	Ditto	9	876½	0	9	1¾
1901-2	Llandaff—For Coal	Ditto	3	1944	0	7	4
1902	Recherche (Catamaran Co.)—For Coal	Ditto	2	956	0	9	8
1903	Ditto (Moss Glen Co.)—For Coal	Ditto	2	667	0	7	6
	Total	...	54	19,917½			

	No. 2 Drill.				
1882	**Beaconsfield—For Gold**	Horizontal, underground	1	68	No record.
1883	Mangana—For Gold	Ditto	1	546	0 15 1
1884	Guy Fawkes Gully, near Hobart—For Coal	Vertical	1	612	0 5 6
1885	Malahide Estate, near Fingal—For Gold	Ditto	5	1397	0 5 6
1886	Carr Villa, near Launceston—For Coal	Ditto	1	571	0 5 4
1886-7	Waratah (Mount Bischoff Alluvial T.M. Co.) For Tin	Ditto	7	1548	0 6 1½
1887	Waratah (Mount Bischoff T.M. Co.)—For Tin	Ditto	7	841	0 11 8
1887	Ditto	Horizontal, underground	1	53	0 7 8
1888	Old Beach—For Coal	Vertical	1	593	Abt. 0 10 9
1888	Campania—For Coal	Ditto	1	600	0 7 7½
1888	Richmond—For Coal	Ditto	1	500	0 5 1¾
1889	Back Creek—For Gold	Ditto	4	787	0 8 5½
1891	Macquarie Plains—For Coal	Ditto	2	989	0 4 5¼
1891	Jerusalem—For Coal	Ditto	1	344	0 4 9½
1892	Langloh Park—For Coal	Ditto	4	1249	0 5 3¼
1893	Southport—For Coal	Ditto	1	612	0 5 3
1894	Zeehan (Tasmania Crown S.M. Co.)—For Silver	Horizontal, underground	2	319	1 0 2½
1902	Eden—For Coal	Vertical	2	566	1 0 7½
1902-3	Farm Cove—For Coal	Ditto	1	571	0 5 6
	Total	...	44	12,766	

Aggregate number of bores 98
Total Distance bored .... 32,683½ feet.

W. H. WALLACE, *Secretary for Mines.*

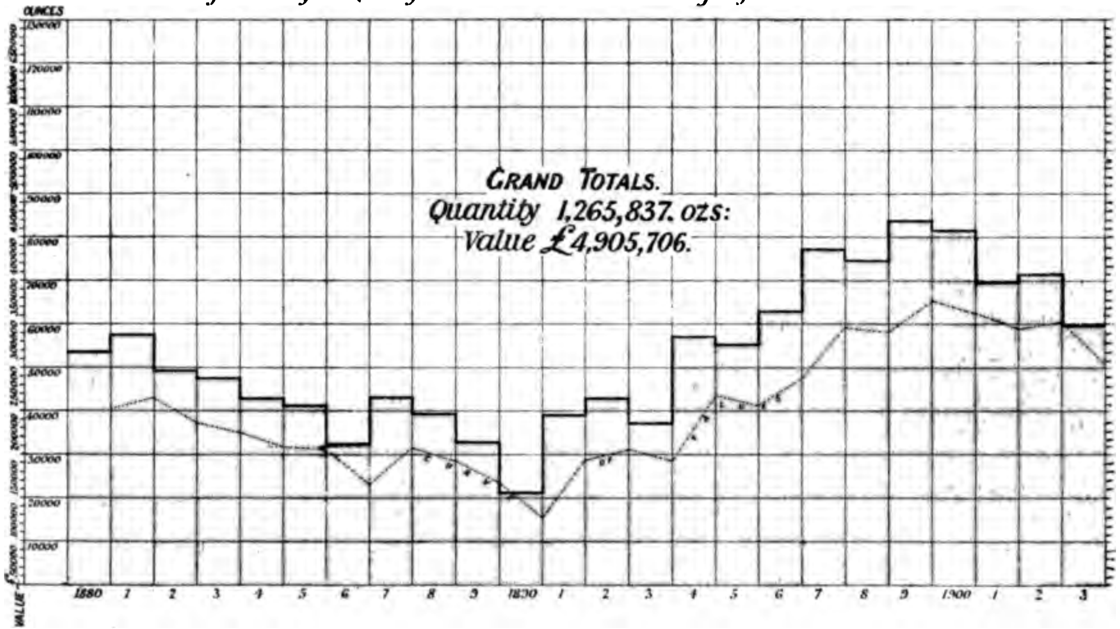
No. 1.

***RETURN** showing the Quantity and Value of Gold won during the Years* 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and* 1903.

Year.	Quantity.		Value.
	ozs.	dwts.	£
1880	52,595	0	201,297
1881	56,693	0	216,901
1882	49,122	6	187,337
1883	46,577	10	176,442
1884	42,339	19	160,404
1885	41,240	19	155,309
1886	31,014	10	117,250
1887	42,609	3	158,533
1888	39,610	19	147.154
1889	32,332	13	119,703
1890	20,510	0	75,888
1891	38.789	0	145,459
1892	42,378	0	158,917
1893	37,687	0	141,326
1894	57,873	0	217,024
1895	54,964	0	206,115
1896	62,591	0	237,574
1897	77,131	0	296,660
1898	74,233	0	291,496
1899	83,992	0	327,545
1900	81,175	0	316,220
1901	*69,491	0	295,176
1902	*70,996	0	301,573
1903	*59,891	0	254,403
	1,265,836	19	4,905,706

* Fine Gold.

Diagram showing Total Quantity & Value of Gold won in Tasmania during the years 1880-1903



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John Vail, Government Printer, Tasmania.

No. 2.

***RETURN** showing the Quantity and Value of **Gold obtained from Quartz** during the Years* **1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902,** *and* **1903.**

Year.	Quantity.	Value.
	ounces.	£
1880	34,345	130,622
1881	45,776	174,956
1882	36,215	137,183
1883	36,672	138,060
1884	30,540	114,630
1885	33,266	124.234
1886	25,004	87,516
1887	33,427	123,453
1888	34,156	126,139
1889	33,069	116,517
1890	17,829	64,184
1891	33,659	126,221
1892	34,386	128,947
1893	30,163	113,111
1894	52,239	195,396
1895	51,628	193,605
1896	59,453	222,948
1897	74,937	288,432
1898	72,080	283,422
1899	81,751	319,141
1900	79,977	311,580
1901	*68,779	292,155
1902	*70,440	299,212
1903	*58,868	250,054
	1,228,659	4,362,218

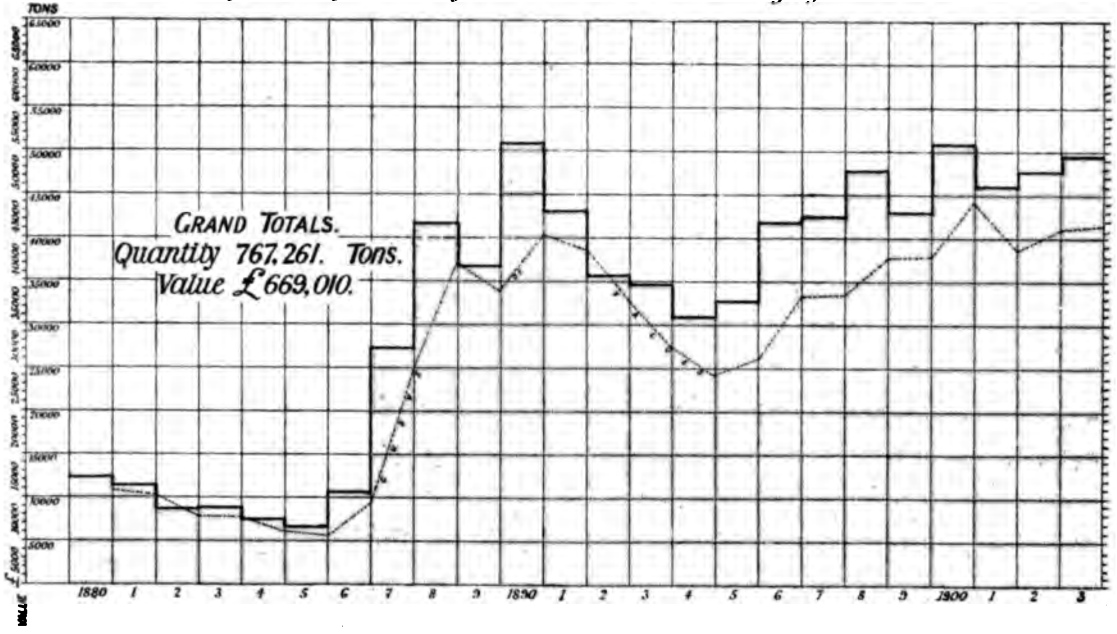
* Fine Gold.

No. 3.

RETURN showing the Quantity and Value of Coal raised during the Years 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and* 1903.

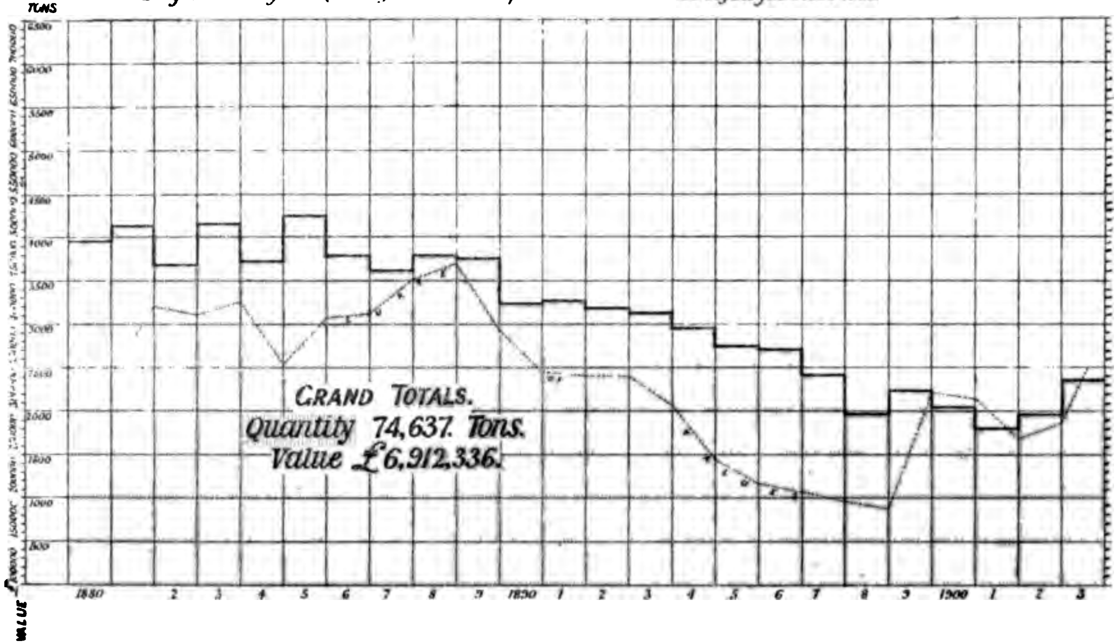
Year.	Quantity.	Value.
	Tons.	£
1880	12,219	10,998
1881	11,163	10,047
1882	8803	7923
1883	8872	7985
1884	7194	6475
1885	6654	5989
1886	10,391	9352
1887	27,633	24,870
1888	41,577	37,420
1889	36,700	33,030
1890	50,519	45,467
1891	43,256	38,930
1892	36,008	32,407
1893	34,693	27,754
1894	30,499	24,399
1895	32,698	26,159
1896	41,904	33,523
1897	42,196	33,757
1898	47,678	38,256
1899	42,609	38,349
1900	50,633	44,227
1901	45,438	38,451
1902	48.863½	41,533
1903	49,069	41,709
	767,261	659,010

Diagram showing Total Quantity & Value of Coal raised in Tasmania during the years 1880-1903



JOHN VAIL. GOVERNMENT PRINTER. TASMANIA.

Diagram showing Total Quantity & Value of Tin exported from Tasmania during the years 1880-1903.



John Vail, Government Printer, Tasmania.

No. 4.

***RETURN** showing the Quantity and Value of Tin exported from Tasmania during the Years* 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and* 1903, *compiled from Customs Returns only.*

Year.	Quantity.	Value.
	Tons.	£
1880	3954	341,736
1881	4124	375,775
1882	3670	361,046
1883	4122	376,446
1884	3707	301,423
1885	4242	357,587
1886	3776	363,364
1887	3607½	409,853
1888	3775¼	426.321
1889	3764	344,941
1890	3209¼	296,368
1891	3235	291,715
1892	3174	290,083
1893	3128½	260,219
1894	2934	198.298
1895	2726¾	167,461
1896	2700	159,036
1897	2423½	149,994
1898	1972	142,046
1899	2239¼	278,323
1900	2029	269,833
1901	1789½	212,542
1902	1958¼	237,828
1903	$2376\frac{3}{20}$	300,098
	$74,636\frac{18}{20}$	6,912,336

No. 5.

RETURN showing the Quantity and Value of Silver Ore produced during the Years 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and* 1903.

Year.	Quantity.	Value.
	Tons.	£
1888	417	5838
1889	415	7044
1890	2053	26,487
1891	4810	52,284
1892	9326	45,502
1893	14,302	198,610
1894	21,064	293,043
1895	17,980	175,957
1896	21,167	229,660
1897	18,364	200,167
1898	15,320	188,892
1899	31,519½	250,331
1900	26,564	279,372
1901	28,774	207,228
1902	46,480	218,864
1903	42,422	192,492
	300,977½	2,571,771

No. 6.

***RETURN** showing the Quantity and Value of Blister Copper produced during the Years* **1896, 1897, 1898, 1899, 1900, 1901, 1902,** *and* **1903.**

Year.	Quantity.	Value.
	Tons.	£
1896	41½	1245
1897	4700	322,500
1898	4955½	400,668
1899	8598	735,305
1900	9449	907,288
1901	9981	879,625
1902	7745	*462,151
1903	6684	*478,023
	52,154	4,186,805

* Value of Gold contained deducted.

No. 7.

***RETURN** showing Quantity and Value of Copper Matte exported during the Years* **1902** *and* **1903.**

Year.	Quantity.	Value.
	Tons.	£
1902	2500	50,112
1903	3727	83,624
	6227	133,736

No. 8.

RETURN showing the Quantity and Value of Copper Ore produced during the Years 1896, 1897, 1898, 1899, 1900, 1901, 1902, *and* 1903.

Year.	Quantity.	Value.
	Tons.	£
1896	34	1020
1897	75	2250
1898	394	8128
1899	1695	26,833
1900	4221½	63,589
1901	11,221	130,412
1902	5994	65,270
1903	102	790
	23,736½	298,292

No. 9.

RETURN showing the Quantity and Value of Iron Ore produced during the Years 1897, 1898, 1899, 1900, 1901, 1902, *and* 1903.

Year.	Quantity.	Value.
	Tons.	£
1897	894	812
1898	1598	1598
1899	3577	3474
1900	5375	5995
1901	612	417
1902	2386	1075
1903	5980	2905
	20,442	16,276

No. 10.

RETURN** showing the Quantity and Value of Asbestos produced during the Years* **1899, 1900, 1901, 1902,** ***and **1903.**

Year.	Quantity.	Value.
	Tons	£
1899	200	363
1900	128	113
1901	46½	45
1902	—	—
1903	—	—
	374½	521

No. 11.

RETURN** showing the Quantity and Value of Wolfram produced during the Years* **1899, 1900, 1901, 1902,** ***and **1903.**

Year.	Quantity.	Value.
	Tons.	£
1899	3½	99
1900	53¾	2058
1901	—	—
1902	—	—
1903	—	—
	57¼	2157

No. 12.

***RETURN** showing the Quantity of Silver Lead and Copper Ore smelted for period 25th June to 31st December,* **1896**, *and 1st January* 1897, *to 31st December*, 1903.

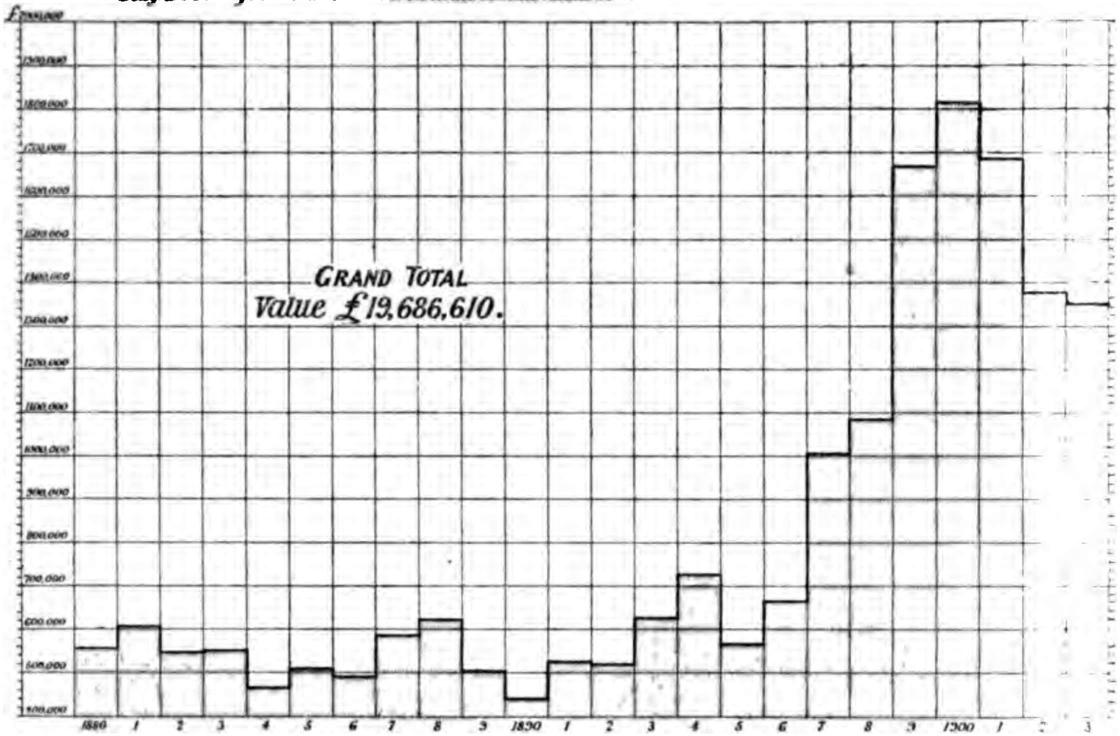
Year.	Ore Smelted.	Products.			Yield.			
		Silver Lead Bull'n.	Blister Copper.	Matte.	Copper.	Silver.	Gold	Lead.
	Tons.	Tons.	Tons.	Tons.	Tons.	Ozs.	Ozs.	Tons.
1896	26,028$\frac{13}{20}$	—	—	2417$\frac{6}{20}$	1235$\frac{1}{20}$	75,951	4707	—
1897	90,773$\frac{1}{2}$	—	3476$\frac{12}{20}$	257$\frac{16}{20}$	3583$\frac{14}{20}$	334,349	16,485	—
1898	170,933	—	4992	—	4783	606,123	24,418	—
1899	275,239	2295	8463	89$\frac{8}{20}$	8362	1,089,657	27,615	—
1900	363,113	4817	9449	—	9341	1,215,036	26,255	—
1901	355,528	1839	9982	50	9880	800,317	21,717	—
1902	411,736	6825	7727	2882	8841	1,674,816	24,719	6654
1903	399,032	7560	6683	3413	8094	1,855,158	25,238	7529

No. 13.

***RETURN** showing the Average Number of Persons engaged in Mining during the Years* **1880** *to* **1903** *inclusive.*

Year.	Number.	Year.	Number.
1880	1653	1892	3295
1881	3156	1893	3403
1882	4098	1894	3433
1883	3818	1895	4062
1884	2972	1896	4350
1885	2783	1897	4510
1886	2681	1898	6052
1887	3361	1899	6622
1888	2989	1900	7023
1889	3141	1901	6923
1890	2868	1902	5934
1891	3219	1903	6017

Diagram showing the Annual Value of Minerals & Metals raised in Tasmania from 1880-1903



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No. 14.

***RETURN** showing the Number and Area of Leases held under "The Mining Act, 1900," in force on 30th June in years 1897 to 1903 inclusive, and on 31st December, 1903.*

Nature of Lease.	In force on 30th June, 1897.		In force on 30th June, 1898.		In force on 30th June, 1899.		In force on 30th June, 1900.		In force on 30th June, 1901.		In force on 30th June, 1902.		In force on 30th June, 1903.		In force on 31st December, 1903.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.
For Minerals, Silver, Tin, &c.	1150	56,493	1290	66,981	1207	64,339	1487	70,500	138[illegible]	60,865	1063	45,399	950	40,068	826	33,325
For Coal, Slate, Shale, &c.	38	6105	41	5943	39	6002	52	7258	55	7566	52	7819	66	10,767	54	9119
For Gold	615	5789	702	7190	652	6725	647	6623	566	6091	425	4166	310	3117	243	2505
Water Rights Mineral and Gold	155	774 sluice-heads.	159	784 sluice-heads.	200	933 sluice-heads.	225	1004 sluice-heads.	267	1318 sluice-heads.	300	1691 sluice-heads.	299	1514 sluice-heads.	281	1460 sluice-heads.

No. 15.

COMPARATIVE Statement of Net Revenue from Mines, being Rents, Fees, &c., paid to the Treasury for the Years ending 30th June, from 1880 to 1903, and for Six months ending 31st December, 1903.

Year.	Amount.			Year.	Amount.		
	£	s.	d.		£	s.	d.
1880	8944	5	11	1893	16,971	9	2
1881	20,936	5	5	1894	16,732	7	7
1882	23,077	1	9	1895	15,323	1	9
1883	15,439	14	5	1896	20,901	13	2
1884	6981	11	10	1897	25,631	0	3
1885	11,070	5	7	1898	33,061	13	9
1886	12,523	10	4	1899	24,696	10	5
1887	14,611	11	5	1900	28,380	11	10
1888	23,502	8	4	1901	21,569	5	2
1889	17,254	9	0	1902	19,471	0	1
1890	26,955	4	9	1903	17,776	14	3
1891	37,829	16	5	1903, 1 July to Dec. 31	14,758	17	1
1892	17,568	18	4				

The above Statement does not include Stamp Duties upon Transfer of Leases and Registration of Companies, or the Tax payable upon Dividends, from which sources large sums are derived.

No. 16.

***RETURN** showing the Total Number and Area of Leases in force on 31st December, 1903.*

Minerals.	Number.	Area.
		Acres.
Gold	243	2505
Minerals	131	7846
Silver	169	8621
Copper	58	3358
Tin	444	12,029
Coal	32	6030
Limestone	11	682
Iron	15	704
Slate	1	200
Wolfram	2	80
Asbestos	2	140
Precious Stones	1	80
Lithographic Stone	1	97
Marble	1	317
Shale	9	2100
Bismuth	1	40
Monazite	1	80
Nickel	1	40
Machinery Sites	22	92
Dredging Claims	15	124
Mining Easements (under "The Mining Act, 1900")	34	225
Dam Sites	43	636
Water Rights	281	1460 sluice-heads, & 180 acres dams

No. 17.

***RETURN** showing the Average Number of Miners employed during the Year ending 31st December, 1903.*

	Europeans.	Chinese.
Northern and Southern Division	582	...
North-Eastern Division	504	137
Eastern Division	793	69
North-Western Division	401	...
Western Division	3531	...
	5811	206

No. 18.

RETURN showing the Mining Companies registered during the Six Months ending 31st December, 1903.

Number of Companies.	Capital.
10	£19,440

In addition to the above, 15 Agents for Foreign Companies, and 5 Syndicates, under 60 Vict. No. 51, were registered.

No. 19.

RETURN showing the Total Area of Land applied for during the Six Months ending 31st December, 1903.

Mineral.	No. of Applications.	Area.
		Acres.
Antimony	1	80
Coal	8	1397
Copper	12	770
Galena	1	37
Gold	58	521
Minerals	36	2071
Nickel	1	80
Phosphate of Lime	1	3
Silver	6	345
Tin	97	2345
Machinery Sites	1	5
Dredging Claims	9	140
TOTAL	231	7794

In addition to the above, 14 applications for Mining Easements, and 38 applications for Water Rights (92 Sluice-heads and 86 acres Dam and Dump Sites) were received.

No. 20.

RETURN showing the total Amount of Rents, Fees, &c., received by the Mines Department during the Six Months ending **31st** *December*, **1903.**

Head of Revenue.	Amount.		
	£	s.	d.
Rent under "The Mining Act, 1900," for Gold and Minerals	14,199	5	7
Fees, ditto ditto	559	11	6
Survey Fees	1181	16	3
Rent of Diamond-drills	—		
TOTAL	15,940	13	4

No. 21.

RETURN showing the Amounts paid in dividends by Mining Companies during the Six Months ending **31st** *December*, **1903.**

Mines.	Dividends.		
	£	s.	d.
Copper	72,187	0	0
Gold	8000	0	0
Tin	37,885	0	0
Silver	18,508	17	0
TOTAL	£136,580	17	0

REPORT OF THE MOUNT CAMERON WATER RACE BOARD FOR THE SIX MONTHS ENDING 31st DECEMBER, 1903.

25th May, 1904.

SIR,

WE have the honour to present the report of the Board for the six months ending 31st December, 1903.

The receipts for the six months amount to £742 4s. 11d. and the expenditure to £424 0s. 5d. Of the amount appearing under the head of repairs to syphons, fully half is represented by stocks of iron and other materials on hand at the end of the half-year.

Water.—Owing to the good rainfall the supply of water available at the intake was fully sufficient to supply all needs.

Race.—Syphon Pipes.—Eighty-three breaks have occurred during the half-year, as against 103 for the preceding twelve months, showing that the syphon-pipes are deteriorating, and breaks are becoming more frequent.

Flumings.—During this term one of the old flumings (No. 2) collapsed, and had to be repaired with old boards; and No. 1 (the intake fluming) is in a very bad state.

In its last year's report the Board recommended the replacement of the flumings by embankments, and suggested that the sum of £3000 be advanced for this purpose. This suggestion still appears to the Board to be worthy of consideration, as in the event of a dry summer the supply from the Little Mussel Roe will be reduced, and the flumings are in such a bad state of decay that they will not carry any more water from the main source of supply than they are now doing, which represents only one-half of the total supply brought in by the race.

In support of the recommendation for the replacement of the flumings, the Board draws attention to the increased output of tin ore, viz., 44 per cent., for the half-year, as compared with the previous year's rate. Since the close of the year the increased activity in the district shows a further substantial increase in the output, and the Board, in view of the greater expenditure for maintenance of the race, contemplates making a moderate advance on the present rates charged for water.

The statistics for the year are as follows :—

Average per week of claims supplied, 11.

Greatest number supplied in any one week, 13.

Total number of heads supplied :—

Under fixed or cash scale, 1432, at an average of 8s. 5½d. per head. Under royalty or credit scale, 590, at an average of 4s. 7 3/5d. per head; total, 2022.

Tin ore raised, 7 tons 10 cwts. 2 qrs. 12 lbs., royalty scale; 45 tons 2 cwts. 25 qrs. 2 lbs., fixed scale; total, 52 tons 13 cwts.

Average number of miners employed: Europeans 32, Chinese 6; total, 38.

Total receipts for the half-year: Fixed scale, £605 11s. 2d.; royalty scale, £136 13s. 9d.; total, £742 4s. 11d.

Expenditure: Cost of maintenance and management:—

	£	s.	d.
Salary and wages	332	16	0
Repairs to syphon-pipes...	62	16	8
Repairs to flumings	8	14	0
Travelling expenses...	13	17	0
Stores and tools	2	10	9
Insurance...	3	6	0
Total	£424	0	5

Paid to Public Debts Sinking Fund, 1903 (including moiety of rents of mineral land served by the race, £17 7s. 6d.), £620 10s. 8d.

Total amount paid to Public Debts Sinking Fund on the 31st December, 1903, £8244 9s. 3d.

Rate of interest for the year upon the cost of purchase and construction, 1·81 per cent.

Total cost of purchase and construction, £34,281 19s.

W. H. WALLACE, *Chairman of the Board.*
W. H. TWELVETREES,
S. HAWKES,
JOHN SIMPSON, } *Members of the Board.*

The Hon. the Minister of Mines.

REPORT OF THE GOVERNMENT GEOLOGIST.

Government Geologist's Office,
Launceston, 31st December, 1903.

SIR,

I HAVE the honour to present my Report as Government Geologist for the half-year ending 31st December instant.

During this period I have submitted the following reports on mines and mining fields:

1. On kerosene shale and coal seams in the Parish of Preolenna, 15th July, 1903.
2. On mineral fields between Waratah and Long Plains, 26th September, 1903.
3. On the Sandfly Coal Mines, 12th October, 1903.
4. On the Dial Range and some other mineral districts on the North-West Coast of Tasmania, 19th December, 1903.
5. On the Abbotsford Creek Gold Mine, 22nd December, 1903.

The above is exclusive of Departmental reports. During the same period Mr. G. A. Waller, Assistant Government Geologist, prepared reports on:—

6. Findon's copper sections, Mount Darwin, 10th October, 1903.
7. The Primrose Mine, Rosebery, 2nd November, 1903.

The rest of his time was devoted to the preparation of a report on the Zeehan district, involving an examination of all the accessible mines, and a topographical and geological survey of that field. The field work was completed by the end of the year; and, as nearly all the known lodes are laid down on the plan, I confidently anticipate that the issue of this carefully prepared chart will be of considerable and permanent use to all interested in mining on that part of the West Coast. The report on Zeehan which will accompany the plan will bring all available information respecting the mines up to date, besides elucidating the structural geology of the field; and both the plan and the report should be consulted together.

The particular fields dealt with in the six reports issued during the half-year may be now referred to.

Preolenna Shale and Coal.

The report issued in July covers the results of a visit which I paid to these outcrops the previous half-year. They are situate on the Arthur track, 17 miles south of Wynyard, and this distance from the sea or main road, combined with the smallness of the seams, precludes the coal from being handled profitably at present.

But, as the rich agricultural Flowerdale district is becoming closer settled, and cultivation of the land is being steadily extended southwards, some public tramway or railway will eventually be constructed for the needs of the district, and this will probably bring the seams within a manageable distance.

Two classes of coal occur here, and sometimes in one and the same seam. One 20-inch seam contains 5 inches of first-class kerosene shale, and 15 inches of long-flaming coal, rich in gas. Another seam (if not the same one) shows 20 inches of similar shale. These shales are equal in quality to the export shale of New South Wales, containing 21 to 23 per cent. fixed carbon, 71 to 76 per cent. volatile hydro-carbon, and 2 to 4 per cent. ash. The long-flaming coal averages 51 per cent. fixed carbon and 43 per cent. volatile hydro-carbon. Numerous other seams exist here, the best being 20-inch seams (or groups of same) of the long-flaming coal, which corresponds closely in nature with the Greta gas coals, though yielding about 1000 cubic feet more gas per ton than those. These seams probably extend further to the north, and search should be made for them north and north-west, so as to reduce the present drawback of distance.

Waratah, Heazlewood, and Long Plains, &c.

This mineral country was also examined the previous half-year, but the report was written during the term under review.

It is a distinctly mineral area, with several known and payable deposits of ore, and abounding with encouraging indications. Tin, gold, copper, silver, lead, zinc, nickel, and osmiridium are found; and the output of some of these has been a strong buttress to the prosperity of the State. The Mount Bischoff and the Magnet mines are in this part of the Island, and for many years there has been intermittent mining along the Whyte River and Heazlewood line of country. A connecting link between this and the Zeehan field is now being forged by the work in the Stanley River tin district.

Tin-mining was going on at the time of my visit at the Badger, five miles from Waratah, where a good belt of granite country, perhaps a mile in width, exists, and which has shed a good deal of alluvial tin rather widely. In some parts of the granite itself rich concentrations of ore are found, and work was begun on these where they were seen at surface. But tin deposits are very capricious, and a well-considered boring scheme is always advisable as a guide to work on any considerable scale. The good market prices of tin ore were inciting prospecting all over this field.

The Magnet Silver-lead Mine has proved its ore body to descend unimpaired to the level to be opened out below its lowest workings, and continues to send away its output to smelters with uninterrupted regularity.

The Confidence and Washington Hay mines are on the old Godkin tramway along the Whyte River. The former is being worked by Mr. McCreery; the latter is idle, pending inspection for flotation. The silver contents of these ores make them valuable, being, in the Confidence, 2 to 3 ounces of silver per unit of lead; and in the Washington Hay about 1¼ ounce. The indications in both of these mines are such as to encourage their further exploration and development.

The Victorian Magnet (formerly Godkin's), Godkin's Extended, Discoverer, and Bell's Reward mines are on a line of contact of granite with sedimentary strata, which is marked by parallel strikes of gossan veins of galena and blende, and disseminations of silver, lead, and zinc ores in the abutting sandstones, slates and limestones. Some very rich silver ores have been met with here at different times, and everything points to irregular impoverishment of the fractured and gossanous zone above water level, and an enrichment lower down. The Victorian Magnet was advancing a drainage tunnel into the hill to connect with old workings, and work was about to be recommenced at the upper mines.

The Wealth of Tasmania Copper Proprietary is working a mile south of the main road at the 14-mile, along the track to Mount Stewart. The object is to test the deposit of copper pyrites known as Binks' show, which is an outcrop of very pure copper ore. Its strike is ill-defined, but a shaft has been sunk, and a drive put out in a direction calculated to intersect it in depth. The drive is in serpentinous rock, the joint planes of which are occasionally faced with copper pyrites and blende. Some quite good copper ore exists, disseminated in massive cliffs near here, but is distributed in the rock rather irregularly.

Gold-mining was proceeding at Cox's face, on H. H. Gill's ridge, at the Long Plains. Weetman and Crockford made their celebrated gold discoveries on these plains twenty years ago. No gold-quartz reefs have been found here, but a good deal of gold (in nuggets up to 5 ounces) has been won from the creeks, as well as in the angular quartz-hill drift, and in softened zones in the schist. The latter has been generally in ragged, spongy, and semi-crystalline forms, denoting precipitation from secondary solution; this has been found in slugs up to 6 ounces 12 pennyweights. Several tunnels have been driven into the ridge across schist belts, in which this gold has been found sporadically, but they have not been successful in opening up any permanent run of gold-bearing material. I formed the opinion that further adit-driving will leave matters pretty well where they are at present, and that to get to the source of all this precipitated gold it will be necessary to resort to shaft-sinking. The ground above water level is simply a zone of distribution; the primary deposits must be sought for in depth.

I visited the Rio Tinto lodes on the Savage River, which are enormous lenses of magnetite and hematite, encased in hornblendic and serpentinous schist, exposed in a bold ridge 700 feet in height, cleft by the Savage. This line of country is known to extend for 14 miles, and all along it, at intervals, are deposits of magnetic iron ores and copper pyrites, accompanied by characteristic minerals (nickel, cobalt, talc, tremolite, asbestos, dolomite, &c.), which point to the action of identical mineralising agents throughout the belt.

Some tunnelling has been done on each side of the river to test the Rio Tinto, in 1896-1898, but a huge formation like this naturally varies in its metallic contents in its different parts, and no payable portions of any size were disclosed, though assays of the capping had shown some fair results in gold and copper. It is not improbable that payable parts of the lode could be located by systematic diamond-drill boring. The copper contents are no doubt being gradually taken down to a zone of enrichment at or near the ground water level, and to get at that zone the work of proving must be taken down below the river. A question which has an important bearing upon the result, and which illustrates how valuable theory may be in governing practice, is whether the iron oxide is the result of the oxidation of pyrites, or whether it is an independent precipitation, because if the latter were the case we should be prepared to find the re-deposition of metal at water-level on a much more limited scale.

Sandfly Coal Mines.

I examined these coal seams, which are situate on the divide between the Huon and North-West Bay water systems. Mr. Montgomery reported very favourably upon them in 1893, since when some additional work has been carried out there, though a good deal remains to be done in the way of exposing the different seams along the line of outcrops, and connecting the latter with one another, so that the seams may be properly identified, as well as testing the ground more systematically by boring. The seam on which the most work has been done is a large double one, consisting of excellent household and steam coal. Other seams of workable size exist on the hill, one (also a double one) containing between 3 and 5 feet of coal of an anthracite nature, having fixed carbon contents, varying from 72 to 83 per cent. In fact, all the coal at the eastern end of the range tends to be anthracitic. The really excellent quality of this coal would have ensured its being worked long ago, but for the preliminary outlay necessary for the construction of a tramway from North-West Bay to the mine, a distance of about eleven miles.

Dial Range and Emu Bay Districts.

I examined several of the mineral deposits in this area.

Silver-lead ore and argentiferous copper and iron pyrites occur on the beach at and near the Penguin. The Penguin Silver Mine, The Neptune, Sullock's and Hardy's mines were started in these deposits. The country rock is traversed by small fractures which have been filled with mineral, but are not sufficiently large to work profitably. The aim should be to get below this zone of ramifying veins, where there is a better chance of finding ore in payable quantities.

On the east side of the Dial Range, the Dial P.A. and Keddie's mines are in a crush breccia zone of granitoid rock, the interstices of which are filled with, and the fragments often replaced by, iron pyrites, with which gold and silver-bearing copper pyrites are often associated. The mining has hitherto consisted of adit-driving, but I think the proper plan is to sink on these deposits, and test them in depth. Further south is Hardstaff's Mine, where an adit was being driven to intersect a fissure vein in granite, containing some solid copper pyrites. If the band of this ore increases to a payable width below the outcrop, a nice little mine will be the result.

There are occurrences of mineral still further south, and the country here eminently deserves prospecting.

On the western side of the range deposits of galena also exist. A vein of bright galena occurs at Badger's Mine; in the lode here are some blende and copper pyrites. The indications are that it will be a copper lode in depth.

The Iron Cliff outcrop of brown hematite descends into the Lady Braddon tunnel, and has been partly intersected by the latter, without, however, any change in its contents. The tunnel should be continued right across the lode, and shaft-sinking begun. This lode, too, I think, will be found to be a copper-bearing one.

The Tasmanian Iron Mine, worked by Mr. J. C. Ellis, of the Penguin, is 3½ miles from the coast. A pure red hematite is being mined and shipped to smelting works in New South Wales for fluxing purposes. The ore as shipped contains 66 to 68 per cent. iron and 2 to 3 per cent. silica. It contains only traces of sulphur and phosphorus, and is suitable for the manufacture of the very best iron and steel.

Massive hematite deposits also occur on Denny and Jones' sections high up on the Dial Range, six miles south of Penguin, but nothing has been done yet in the way of proving them, beyond a few cuts.

Blythe and Stowport Districts.

I examined two copper mines here—one the Rutherford Mine, two miles south-west of the Blythe Iron Mine; and the other the Blythe P.A.'s mine, on the Blythe River, 3½ miles from its mouth.

Both of these are in clay slates, which appear to form a belt of copper-bearing country extending north and south for a considerable distance. The copper lodes are approximately parallel with the large iron outcrop at the Blythe, and this, and their contiguity to that deposit, have given rise to a surmise that the latter may be replaced by copper ore at a depth. The absence of lode minerals in it makes this supposition improbable, but the nature of its relationship (if any) with the recent copper discoveries is well worthy of renewed examination. The iron deposit possibly continues south as far as Rutherford's, for similar iron ore exists on that property. My examination led me to the belief that other, and possibly more important, deposits remain to be discovered in this area, which, being an agricultural one, has not received much attention from prospectors.

Abbotsford Creek Gold Mine.

I inspected this mine, which is situate at Tullochgorum, near Fingal. Three adits were driven on a strong quartz reef, averaging 4 to 6 feet wide; 1500 tons of quartz were raised from it and crushed, but only returned 2·72 grains gold per ton. After examining and sampling the mine, I arrived at the conclusion that, though at or near the surface the reef carried a little gold, as opened up by the levels it is practically valueless. The only prospecting work which offers a chance of any future improvement is to continue the lower level, and to sink.

Findon's Copper Sections, Mount Darwin.

Mr. G. A. Waller examined this property, which is on the ridge connecting Mount Darwin with Mount Jukes. The deposit consists of iron and copper pyrites, disseminated through chloritic schistose felsite. Bulk sampling indicated percentages of copper varying between 2 and 3; and the Assistant Geologist considers that there is a reasonable prospect of further work, at a moderate depth, disclosing large bodies of stone carrying from 2½ to 3½ per cent. copper. From experiments which he made, he is of opinion that the most suitable treatment for the ore would be a combination of the ordinary methods of wet concentration with the Elmore oil process. There are other deposits of a similar type on Mount Darwin, and successful work on the mountain would be fraught with important beneficial results to the State.

Primrose Mine, Rosebery.

Mr. Waller examined this well-known zinc-lead sulphide deposit, which is an extension of the ore-body in the Tasmanian Copper Company's ground. The sulphide ore contains from 9 to 19 per cent. lead, 30 to 33 per cent. zinc, 0·6 per cent. copper, 6 to 11 per cent. iron, 11 to 20 per cent. silica, and carries from 2 to 27 dwts. gold and 7 to 17 ounces silver per ton. This ore has not yet been submitted to treatment; some of it is considered as capable of giving a decided margin of profit over and above mining and smelting charges. Tributors have been stripping the gossanous capping of the lode, and sluicing it for gold. This assayed from 3 to 10 dwts. gold and 11 to 36 ounces silver per ton. Several hundred tons of this gossan were in sight, and it was impossible to say how much more may be exposed as work goes on. Mr. Waller was of opinion that by making two products, one consisting of hard gossan for sale to smelters, and another consisting of the soft friable gossan, for treatment in sluice-boxes, the whole can be profitably handled.

Progress Reports.

I have compiled two Quarterly Reports on the progress of the Mineral Industry during the period. These have a fair circulation abroad, and are a useful means of disseminating a knowledge of our mines and mining. I am desirous of improving these in every possible way, and shall welcome any useful suggestions which may be sent to me. If mine managers or agents would furnish me with a quarterly summary of the mine work and its prospects, it would help to increase the value of these reports.

Office.

During the half-year seven geological and two progress reports have been issued, and the correspondence has amounted to 1264 letters, &c., in and out. Mr. F. S. Grove has continued his examination of the plans of underground surveys, but owing to his time being otherwise fully occupied, the arrears cannot be further dealt with.

Specimens of minerals, rocks, and fossils for the office collection have been received from Messrs. W. F. Petterd, H. Conder, A. Simson, H. Grant, J. Thomson, and J. J. A. Stitt, which are acknowledged with thanks.

Government Drills.

The diamond-drills were not working this half-year. The alluvial boring-plant was let to Messrs. Medwin and Traill, on the Tamar, for testing ground for coal. Work was started here in the tertiary lignitic series of clays and sands; but the coal measures which possibly underly those beds have not yet been reached.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES, *Government Geologist.*

W. H. Wallace, *Secretary for Mines, Hobart.*

REPORT OF THE CHIEF INSPECTOR OF MINES.

Inspector of Mines' Office,
Launceston, 31st December, 1903.

SIR,

I HAVE the honor to submit my Report on the inspection of mines for the six months ending 31st December instant.

I beg to attach hereto statistical tables of accidents, and the reports of Mr. M. J. Griffin, Inspector of Mines for the Northern and Southern, Eastern and North-Eastern Divisions; and of Mr. Jas. Harrison, Inspector of Mines for the Western and North-Western Divisions.

Inspector Curtain was retired at the end of the year in pursuance of a policy of retrenchment.

The number of men employed this half-year in the mines and smelting works of the State was 5604, as against 6484 the previous year; of these 207 were Chinese.

The fatalities were 8, and other injuries (serious enough to be recorded) totalled 20. The death rate from accidents was 1·428 per thousand, compared with 0·925 the preceding year. Of these fatal accidents, 5 occurred in the Eastern and North-Eastern Divisions and 3 in the Western Division. This rate is higher than it has been for the last four years. It has been exceeded in five years out of last ten years, attaining a maximum in 1897-8, when it was 2·351. A thorough-going comparison, however, cannot be instituted for this term, as the statistics hitherto have been yearly, and not half-yearly. The serious accidents (other than fatal) have been only 3·569 per 1000, being considerably less than in the two preceding years. But it is impossible to base any serious comparison on this, because injuries which are near the borderland of serious and trivial may be regarded differently by different managers. One manager reports that a workman has grazed his toe; another does not consider it necessary to report an accident which sends a man home disabled from work for a few days. Consequently, the serious accident of one is equivalent to the trivial one of another, and *vice versâ*.

The wording of Section 89 of the Mining Act of 1900 contributes to this confusion, for it only provides for the notification of "any accident attended with serious injury to any person." I am in favour of the word "serious" in this section being deleted, and of all accidents being reported and dealt with. The serious ones can then be extracted for purposes of comparison.

Notwithstanding the elaborate statistics referring to mining accidents in Great Britain, it is almost certain that the number of serious accidents which are unreported is sufficient to invalidate the published averages. The Departmental Committee appointed to enquire into the notification of industrial accidents in 1902 suggested that, at mines and quarries, there should be three classes of reportable accidents, viz.:—

1. Fatal accidents. 2. Accidents from special causes (*e.g.*, explosions, electric shock, &c.). 3. Accidents causing more than a

fortnight's disablement. It proposes to continue the present obligation of reporting accidents causing "serious personal injury," the word "serious" meaning fractures of skulls or limbs, dislocation of limbs, and other accidents equally serious.

It is highly desirable that a mutual agreement be arrived at among the Inspectors of Mines in the different States of the Commonwealth, defining accidents which are to be recorded in the tables. In my opinion, a fortnight's disablement, as suggested for Great Britain, is far too wide a limit for the definition of a serious accident; a week, or even three shifts, would be a better time-limit. If we can come to an interstate understanding on this question, the non-fatal accident statistics will have a definite comparison value, which at present they do not possess.

Whatever meaning may be attached to the word "serious," a requirement that even trivial accidents should be reported to the Inspectors, would in some cases possibly result in the investigation of circumstances which, although attending an actually trifling accident, might have produced a more serious one.

The Inspectors have regularly examined ropes, chains, and cages, and the ventilation of mines; in some cases ordering the removal of defective cages and their replacement by safe ones. In one mine further work was prohibited until a better supply of air was provided. Defective ventilation is reported to exist at two mines, both at Beaconsfield, viz., the Tasmania and the North Tasmania. The former company has been endeavouring to improve matters by introducing new appliances, which have not proved quite satisfactory. The North Tasmania suffers frequently from bad air; and, as the tributors have to climb 300 feet of ladders from their work to the surface, there is some risk: Inspector Griffin is calling attention to this.

Work at the Dulverton Colliery had to be prohibited temporarily, until precautions for safety prescribed by the Inspector were taken.

Inspector Griffin mentions in his report the necessity for dwelling in a less remote place than Gladstone. In some cases, owing to the distance, he has been unable to arrive on the scene of an accident within proper time; in other instances it has not been possible to examine promptly occurrences which, though seemingly trivial, yet require investigation at once; and finally, Gladstone is so situated geographically that news of his intended visits often precedes his arrival at particular mines. A more centrally situated place of residence, such as Launceston, would be preferable.

The Hon. the Minister of Mines has brought under my notice the question of auxiliary inspection of mines by workmen. This is practised in the other States of the Commonwealth, and in New Zealand; and its introduction here would be advantageous as not only strengthening the hands of the Inspectors, but in giving the workmen a legitimate remedy when, owing to the distance, the Inspectors' visits are infrequent. Our Inspectors recommend provision being made in this direction.

The regulations submitted last year by Inspector Griffin for the daily and weekly inspection of coal mines have, I understand, been approved of by the Department, and are in the hands of the Parliamentary draftsman. It is matter for consideration whether, when a new Mining Act is passed, regulations for collieries should not be embodied in it as a separate part or division.

As soon as practicable I should like to have a conference of the Inspectors, in order that we may discuss personally proposed additions to the regulations, and other matters connected with the administration of the Act.

In conclusion, I wish to make mention of the efficient services rendered by the Inspectors in their arduous journeys and examinations during the past term.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES, *Chief Inspector of Mines.*

W. H. WALLACE, ESQ., *Secretary for Mines, Hobart.*

COMPARATIVE Table of Statistics of Accidents in and about the Mines of Tasmania from 1st July, 1892, *to 31st December*, 1903.

Period.	Number of Miners employed.	Number of Accidents.	Number of Persons.		Total killed and injured.	Average per 1000 killed and injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
1 July, 1892, to 30 June, 1893	3295	28	4	25	29	8·8001	1·214	7·586
„ 1893 „ 1894	3403	25	7	20	27	7·934	2·057	5·877
„ 1894 „ 1895	3789	26	4	24	28	7·300	1·058	6·332
„ 1895 „ 1896	4160	22	7	16	23	5·529	1·682	3·847
„ 1896 „ 1897	4303	36	7	31	38	8·831	1·627	7·204
„ 1897 „ 1898	5530	36	13	33	46	8·318	2·351	5·967
„ 1898 „ 1899	6180	35	9	34	43	6·957	1·456	5·501
„ 1899 „ 1900	6834	19	7	16	23	3·365	1·024	2·341
„ 1900 „ 1901	7017	29	8	23	31	4·417	1·140	3·278
„ 1901 „ 1902	6438	38	7	35	42	6·524	1·088	5·437
„ 1902 „ 1903	6484	44	6	43	49	7·557	0·925	6·632
30 June, 1903, to 31 Dec., 1903	5604	27	8	20	28	4·977	1·428	3·569

TABLE, showing the Number of Persons Killed and Injured in and about the Mines of Tasmania during the Six Months, 1st July to 31st December, 1903.

PLACE OR CAUSE OF ACCIDENT.	INSPECTION DISTRICT.															
	Northern and Southern Division.		North-Eastern Division.		Eastern Division.		North-Western Division.		Western Division.				TOTAL.	
									Zeehan and other Districts.		Lyell District.			
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
UNDERGROUND—														
Falls of Ground	...	1	...	...	...	1	...	...	...	1	...	...	...	3
Shaft Accidents—														
Suffocation by natural gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Overwinding	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	...	1	...	...	...	...	...	...	...	1	...	...	...	2
Falling in or into shafts	...	...	1	...	1	1	...	...	1	...	...	1	3	2
Things falling into shafts	...	...	...	...	...	...	...	...	...	1	...	...	...	1
Explosives	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Total	...	1	1	...	1	2	...	...	1	2	...	1	3	6

Miscellaneous (underground).														
Explosives	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Suffocation by natural gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Haulage—														
On inclined planes	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
By trams and tubs	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Machinery	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sundries	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Total	...	2	...	...	...	...	...	...	...	...	...	...	...	2
Total underground	...	4	1	...	1	3	...	...	1	3	...	1	3	11
ON SURFACE—														
Smelting Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Boiler explosions	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tramways	...	1	...	...	...	...	...	...	...	...	2	1	2	2
Explosives	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Falls of ground	...	...	...	...	2	...	...	...	...	...	...	3	2	3
Miscellaneous	...	...	1	...	...	...	...	...	...	2	...	1	1	3
Total on surface	...	1	1	...	2	1	...	...	...	2	2	5	5	9
GROSS TOTAL	...	5	2	...	3	4	...	...	1	5	2	6	8	20

REPORTS OF THE INSPECTORS OF MINES.

Mr. INSPECTOR HARRISON (stationed at Zeehan) reports :—

I have the honour to submit to you the following report for the half-year ending 31st December, 1903.

Accidents.—In doing so, I am pleased to be able to state that the accident list is a very light one, being :—One fatal and five non-fatal. The former was a tributor named M. Maher, who, in climbing up a shallow shaft, fell and ruptured himself. He afterwards succumbed to the injuries received.

Safety Appliances.—The mines are well equipped with necessary safety appliances. Ropes and cages have been tested, as required.

Ventilation.—The ventilation of the mines is, on the whole, good. In one instance I found it necessary to stop all mining until a better supply of air was provided by the manager.

Magazines.—The magazines are being well attended to. A few more have been added to the list. I had one parcel of damaged explosives destroyed.

Output from the District.—The output from the district for this term has shown a gratifying increase on the corresponding term of previous year; and it is worth mentioning that the Tasmanian Smelters are now in a position to treat much lower-grade ore to advantage than what they were last year.

In conclusion I may state that we can reasonably look forward to a further increase in the output from the field in the near future.

LIST of Accidents in Inspector Harrison's District for the Six Months, 1st July to 31st December, 1903.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1903. 16 July	Zeehan Queen	Mt. Zeehan	Fall from top brace	Male, Isaac	Married	Shock to system	Was putting down new floor on top brace and fell to ground, about 30 feet.
10 Aug.	Sth. Comstock	Ditto	Truck fell over tip.	Easterbrook, Gordon	Single	Bruises	Emptying a truck which ran over end of tip, carrying Easterbrook with it.
21 Sept.	Oonah	Ditto	Fall of stone	Poland, Thos.	Ditto	Hurt about loins	Preparing to timber a rise, piece of stone came away and struck him on side.
6 Sept.	New Mount Zeehan	Ditto	Fall down shaft	Maher, Michl.	Married	Internal ruptures Died 2nd October	Coming up shallow shaft with the aid of a rope, slipped and fell to bottom, 18 feet.
8 Oct.	Zeehan Western	Ditto	Jambed by bucket in shaft	Spencer, Jas.	Ditto	Broken ribs and bruises	Repairing shaft, and in attempting to pass an iron sinking bucket, which was on the stage, he pulled it over on himself.
14 Nov.	Zeehan (Tas.) S.L.	Ditto	Fall of timber in shaft	Hook, Harry	Ditto	Scalp wound	Sinking shallow shaft, bucket knocked piece of timber down, which struck him on head.

Fatal, 1 ; non-fatal, 5 ; total, 6.

LIST of Accidents in Inspector Curtain's District for the Six Months, 1st July to 31st December, 1903.

Fatal, 2; Non-fatal, 6; Total, 8.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
24 July	Mt. Lyell M. & R.	Mt. Lyell	Slip of piece of rock	Collins, Michael	Single	Dislocated ankle	Was engaged shovelling in bench 3A, a slab of schist slid over on to his ankle.
27 July	Ditto	Ditto	Fall of rock	Fogherty, Timothy	Widower	Scalp wound	Laying tramline on 4 bench, when a stone dislodged from 3A struck him on head.
6 Aug.	Ditto	Ditto	Run-away trucks	Wells, Thomas W.	Single	Several ribs broken, and lung injured	Three trucks broke away on haulage-line, and dashed into the ore-bins, carrying them away. Wells was sweeping out the ore-bins, and was carried with them.
6 Sept.	Ditto	Ditto	Run-away truck	Jacobs, Robert	Single	Concussion of brain, causing instant death	Were riding up haulage-line on empty truck; a full truck of firewood escaped from top of haulage, and dashed into truck on which they were riding, smashing it.
"	Ditto	Ditto	Ditto	Sturgess, Leonard	Single		

13 Nov.	Ditto	Ditto	Fall of rock	Smith, James	Married	Fracture, both legs below the knee	Barring down face; piece of ore on which he was working canted over, struck ledge on which he stood, and carried the whole away.
17 Nov.	Mt. Lyell Blocks	Ditto	Fall of stump	McPeak, John	Single	Broken rib	Working at concentration site; a portion of a stump, which had been grubbed, rolled from a higher bench and struck him.
18 Dec.	Mt. Lyell M. & R. North Lyell Mine	Ditto	Fall in shaft	Metcalf, William	Married	Sprained ankle	Timbering main shaft at North Lyell; platform on which he stood gave way, and he fell a distance of about 20 feet.

Mr. **Inspector Griffin** (stationed at Gladstone) **reports** :—

I have the honour to submit my report for the Northern and Southern, North-Eastern, Eastern, and North-Western Divisions for the six months ending 31st December, 1903.

Accidents.—I very much regret having to report that out of 14 accidents recorded during this period, five were fatal. In connection with these I may state that the accidents were caused through carelessness or want of caution on the part of the injured men themselves, with one exception, that of Edward Threehee, in whose case the accident may be classed as unavoidable.

Fatal Accidents.—James Green, a single man, age about 40 years, was employed at the Star of Peace Tin Mine as horse-driver, trucking stone from a short pass connecting a tunnel with the open-cut workings 18 feet above. The pass had been standing full for a week or so. Green worked by himself, and was last seen alive about 2 p.m. on the day of the accident; he was then taking the horse and trucks into the tunnel. He not having returned at the usual time for knocking off work—5 p.m.—a search was made, and his dead body was found lying on the lip of the pass, the head and shoulders being thrust inside the door, and covered with loose stone and dirt. From all the surroundings, and from the fact that the pass was nearly empty when the accident took place, it would appear that the unfortunate man, to make sure that the pass was quite empty (his last truck not being quite full), thrust his head inside the door, knowing that if it were empty he could see daylight through it; was struck on the head by a small stone, and rendered insensible, the loose earth and small fragments of stone—there was still some of this in a fringe round the top entrance to the pass—slowly falling about his head until he was suffocated. The medical testimony went to show that he died from suffocation, and that the cut on the head was not sufficient to alone cause death. No person is to blame for this accident.

Alexander Williams, a single man, aged 40 years, was engaged as shift-boss, at the open-cut face of the Pioneer Tin Mine. After the occurrence of a heavy fall of earth, he went to the top of the face to trim off some overhanging turf and clod, ventured too near the edge, the turf giving away beneath his feet; he fell 30 feet on to broken cement and lumps, and received severe injuries to his back and spine, from which he died a few hours later. No blame attachable to anyone for this accident.

Edwin Dudley Treehee, single, age 29 years, engaged at hammer and drill work in the open-cut face of the Anchor Tin Mine, was putting a hole into the toe of face-rock at the level, when he was struck by a rather large lump of stone, that fell from the face; he received injuries to the right side of his head, shoulder, and body; also a nasty transverse wound above the right knee. The doctor was soon in attendance, and for two weeks Treehee was progressing towards recovery, when he unfortunately insisted on getting out of bed, and in doing so ruptured an injured lung, and died suddenly. The portion of the face where this accident happened was worked at a reasonably safe slope. Treehee himself cleaned down the face, and, as he thought, removed all loose or dangerous stones, just before he commenced to drill the hole he and his mate, Taggart, were at when the accident happened. The stone that struck him came from a vertical head a few feet in height and about 20 feet above where he was working. Heavy rain was falling at the time, and this probably loosened the fragment of rock that fell. Treehee, when questioned a few days after the accident, said he had no one to blame, and that he thought the face was safe after he cleaned down the loose rock.

John Quinn, a married man, was foreman of shift at No. 2 face, Anchor Tin Mine. Some shots had been fired about halfway up the face—25 feet or so. Edwin Pride, who had charge of this work, told Quinn the shooting had loosened rock higher up, and asked if he (Pride) would go and bar it down. He was told not to mind doing so. Quinn then sent his son, Ernest, and another man to drill a hole in a point of rock below, and a little to one side, of the loosened mass. They were at this work for a little while, when he went up and told them it did not look too safe, and that they had better come away. He then crossed over below the dangerous rock, viewed it from the other side, and then commenced to descend to the level, which he had nearly reached, when he was heard to call out, "look out," and a moment later he was struck and knocked to the foot of the face by a large stone, the mass of loosened rock following and crushing him to death instantly. No one can be blamed for this accident. When men experienced at their work, as Quinn undoubtedly was will carelessly run into danger that could easily be avoided, it is not surprising to hear of their being killed or injured.

Edward Burles, single, aged 45 years, was engaged shaft-sinking at the Tasmanian Consols Gold Mine, and was, with his mate, Talbot Brooks, working at the 1280-feet bottom on Christmas eve. At 10 p.m. they ascended on the bucket, which was hoisted by an air-winch, to the 1200-feet plat. Brooks got off first. The winch-driver, William Dunn, noticed that Burles did not move for several seconds; he then put out one foot as though in the act of stepping off, but suddenly disappeared down the shaft, and was instantly killed, the fall being 80 feet, on to the bare rock bottom. Burles was known to be one of the oldest and most experienced miners on the field, and was at all times most careful when engaged in the work of shaft-sinking. No blame attachable to anyone for this accident. The hauling equipment was good, and the plat at the 1200-feet, where the men ascended to, was well lighted at the time of the accident.

Serious Accidents.—Joseph Solomon, engaged at the New Golden Gate Mine, in open-cut mullock face, was caught and covered up by a run of loose earth. Injuries not very serious; he returned to work in a few days.

Daniel Thorne slipped and fell a couple of ladders in a rise at the New Golden Gate Mine. He got a very severe shaking, and was three weeks off work. Accident unavoidable.

Christian Olsen was working in the Marialva Coal Mine at Colebrook. He improperly removed a prop, after being cautioned not to do so; portion of the roof fell on him, causing severe contusions about the body and legs. He was removed to the Hobart Hospital, from which he was discharged a fortnight later, apparently all right.

William Keltie was working in a winze at the New Golden King Mine. A fragment of quartz flying from the pick-head struck him in the eye. He went to the Hospital for treatment. When last heard of, a fortnight after the accident, it was feared he would lose the sight of the injured eye.

John Robertson was engaged as foreman of a party, cutting down and enlarging a shaft at the Tasmania Gold Mine, when he was caught by the descending cage. Fortunately, the cage was moving very slowly, almost stopping, when it reached him, otherwise he would have been killed; as it was, he escaped with a few bruises, and was enabled to return to work after a week's rest. Inquiry into cause of this accident disclosed a careless system of working, as there was no definite means by which the braceman could warn men employed in different parts of the shaft of his intention to lower or raise the cage past them when it was wanted at the bottom, 1000-feet level. The head pitman in charge of the shaft alterations was to blame, for allowing the cage he himself had just ascended to the surface in to be immediately used by a man who wanted to go to the bottom level, and without any warning being given to the men in the shaft. To the engine-driver in charge of the winding-engine is due the credit of having, without any instructions to do so, slowed his engine almost to stopping when the cage was nearing men at work in the shaft; had he not done so in this instance, Robertson would have certainly been killed. A proper system of signalling, by means of bells, which denote a movement of the cage in any part of the shaft in which men are working at alterations or repairs, is now in use, and found to work well.

James Thomas was endeavouring to push a truck on a slight incline at the Tasmania Gold Mine. The effort was too much for him; the truck came back, and he was jammed between it and another one. Sustained contusions of back. Doctor considered injuries not very serious.

Herbert Wellington, at the Tasmania Gold Mine, attempted to jump on to a loaded truck he was running on a brace-tramway, and received injuries that caused an abscess to form in the perineum; was in hospital for a fortnight.

Accidents less Serious.—John Tregaskis, at the Tasmania Gold Mine, was dressing a piece of timber; the adze slipped, inflicting a nasty gash on the calf of his leg.

John Irvine, at the New Golden King Mine, was trying to take a kink out of shackle-chain on cage, and got one of his fingers crushed.

Ropes, chains, shackles, and cage-gearings have been regularly inspected, and, as a rule, found in good working order. In some few cases, cages found defective in the safety-gear have been removed, and replaced by safe working ones.

Ventilation.—This was good in most of the mines. There are two exceptions, the Tasmania G.M. Co. and North Tasmania, both at Beaconsfield. The former company effected a great improvement in the ventilation of its mine in the early part of the year, by the introduction of a powerful blower, which, however, is not at present doing good work, owing to the defective state of the boxed air-drifts, which were at first constructed with timber frames, covered with rubberoid. The blower-fan being reversed, so as to serve as an exhaust, soon made wreck of the rubberoid, and now, boxes wholly of timber are being put in; meantime, the ventilation in different places, especially winzes, in the mine is defective. At the North Tasmania Mine the ventilation is very often defective. This mine is generally worked by a tribute party, who are responsible, or supposed to be responsible, so far as the company is concerned, for the safe working of the mine. On the occasion of my last visit, I was informed that no work had been done for several days, owing to the presence of foul air in the mine. A horse-whim is in use for hauling; the men have therefore to descend and ascend by the ladderways to the 300 and 350-feet levels, a practice that is fraught with danger when bad air is present in the mine. I would like to see a new regulation introduced into our mining laws, making it compulsory for all mine-owners working their mine below a depth of 150 feet to provide a safety-cage, to be worked by steam or other suitable power, for the men employed to ascend and descend by. No man should be asked or required to climb over 150 feet of ladderways after his day's work. Apart from other considerations, there is risk of accident, or of a man being overcome by foul air, and no means of getting to the surface except by the whim-bucket. In the case of the North Tasmania Mine, six tributors, men and boys, are working a very small make of stone at the 300-feet level. Good ladderways are provided in the main shaft; there is also an old underlay shaft connecting with the 200-feet level, which, when kept open and in repair, provided a good travelling-way for the men, and improved the ventilation of the mine; this is now out of use. The company refuse to expend any money in keeping it in repair; the tributors cannot afford to do so, so must go on climbing 300 feet of ladders to and from their work, and take their chance of being overcome by foul air.

Mines Inspected.—All the mines at or near the following places have been inspected once, many of the principal ones twice, and some few a third time, during the half-year to 31st December, 1903; viz. :—Pioneer, Moorina, Weldborough, Lottah, St. Helens, Mount Nicholas, (coal), Mathinna, Mangana, Abbotsford, Avoca, Beaconsfield, Lefroy, Dulverton, and Spreyton (coal), Penguin Iron Mine, Stowport and Blythe copper syndicates; also York Plains, Colebrook, and Mount Cygnet coal mines. Work had been suspended at Mt. Cygnet Mine for a month or so prior to my visit in November. There is a nice workable seam of coal, worked to the dip. Haulage is by means of a portable engine. The workings east have now reached more settled country, clear of the faulting noticeable near the main heading, and a better and more even roof and floor are obtained. It is, or was, at time of my visit, intended to improve the haulage-line, by extending a branch south-easterly from a point a little way down from the entrance to the present tunnel, when the work of coal-getting will be resumed.

Marialva Coal Mine, Colebrook.—No work doing below on the day of my visit, owing, it was alleged, to the enginedriver having left the night before. Strange that this mine should be stopped the very day the inspector arrived. The working of this colliery was most unsatisfactory under the management of Mr. Sutcliff, junior. It is now in the hands of Mr. C. Jack, of Hobart, who gave as an excuse for not having provided a ladder-way and other things necessary for the safe working of the mine ordered by me, that when he took over control of the mine from Mr. Sutcliff, the latter did not give him the mine record-book, in which I had made entries of things required to be attended to. This carrying off the record-book is often done by managers who do not care to leave written evidence of their neglect, or incapacity to carry out necessary improvements for the safe working of the mine of which they have had charge. The accident to Christian Olsen, which occurred in this mine in August last, points to careless methods of working. Mr. Jack has now full control of this and of the adjoining coal mine, formerly owned by Mr. Morrison, and I anticipate a better and safer system of working in future.

Mt. Nicholas Colliery.—This is now being worked in a fairly satisfactory manner; faulting of the seams is less frequent. A succession of these down-throw faults has for some considerable time rendered long-wall working difficult, breaking as they do the continuity of the roof, and also interfering with drainage. When visited in March last, this colliery was working only five days a week, owing to a falling off in the demand for coal.

Cornwall Colliery.—This is generally worked in a satisfactory way with regard to the safety of the men employed; ventilation is at times rather dull. The 6-feet seam in main workings is now split up by a band of white sandstone, which, getting broader as the work advanced, interfered a good deal, and made the seam less profitable to work; the bottom coal, about 18 inches beneath the band, had to be left, and work is now carried on the upper portion of the seam in 3 feet 6 inches of good coal. The band, which appears to be lens-shaped, will probably feather out or be reduced to the few inches it represented when first met with. About 76 men and boys, including surface hands, are employed. Output of coal, 90 to 100 tons per week; full time worked.

Dalmayne Coal Mine, situated about 9 miles south of St. Marys. I did not see this, as all work was suspended prior to my visit to the locality, failure of negotiations to float the concern being, I am informed, the cause.

Dulverton and Spreyton Collieries.—Not very much doing in these localities. At the Dulverton Colliery a new tunnel has been driven parallel to and a few chains west of the old one. The approach to, and opening of this new tunnel, was not being carried out in a satisfactory way; the owners, on being apprised of this, promised that the alterations and improvements required would receive immediate attention. When I again visited the mine, three months later, it was to find things in a most unsatisfactory condition. The tunnel had been driven 88 yards, and six men were employed hewing coal. The tunnel, too low at best, had almost collapsed in places, owing to defective timbering. The drainage was also bad, mud and water covering the floor at the entrance and for over two-thirds of its length. The manager, when spoken to about this, admitted having received instructions from the owners to carry out the alterations and improvements necessary for proper working, and would have done so only that these instructions were almost immediately countermanded, and he was told to proceed with the work in the way in which he commenced it. It was now time to enforce compliance, I therefore gave the owners notice to have the necessary improvements, timbering, drainage, &c., carried out within fourteen days, and that until such time as this work was completed, no men were to be allowed to work in the coal faces or heading. I returned at the end of the time named, and was glad to find the alterations and improvements necessary for the safe working of the mine had been carried out—if not in the best possible way, at least so as to render the place safe. Am not very well pleased with the action of the owners of this colliery, Messrs. Ockerby & Co., of Launceston, in connection with their countermanding the instructions at first given. They will now perhaps understand that they must not risk the lives or safety of men they employ in their endeavour to get out coal cheaply.

Teesdale and Co. have opened on the same seam as worked in the Dulverton Colliery, but on the opposite side of the valley, and going into the hill, west, the seam is 18 inches, with roof and floor of hard sandstone. Rolls and faulting caused a good deal of trouble at first, but now more settled country is being reached. A tramway from Dulverton Railway Station to this colliery, 1½ mile, is now in the course of construction.

Spreyton Colliery.—The proprietor, Mr. Allinson, has now opened on the west side of the valley, on the same seam as previously worked to the eastward. Here, as at Dulverton, the seam is only 18 inches in width, and accordingly, difficult to work.

Mr. Bound, a small farmer, has opened on the same seam, and close to the Spreyton Colliery, but not much has been done so far. This is called the Illamatha Colliery.

New Mines.—At Stowport Road, 9 miles from Burnie, the Rutherford Prospecting Syndicate are opening up what appears to be a good copper show. Their method of working is rather primitive, and leaves lots of room for improvement. Further to the north-east the Blythe Prospecting Association have done some work on what is supposed to be a continuation of the Rutherford lode. Intermediately between these two—Blythe and Rutherford—another syndicate are about to commence work. Altogether, there is promise of payable copper lodes being opened up in the locality.

Hardstaff's and other prospecting shows south of Penguin are not doing much.

Middlesex.—Very little doing in this locality. The Devon Silver Mine is the only one that manages to keep going, although not very much has been done for the half-year. Mr. Hartwell Conder, mining engineer, of Launceston, has now control of this property, and preparations are being made for developing the mine. The cost of transit of ore from, and of mining requisites to, this locality is a great drawback. What is required is a light line of railway from Leith, traversing the Wilmot country, and extending to the Bell Mount, Middlesex, and Dove River mineral areas.

Gold Mining—No new discoveries worth mentioning, with the exception of the Miners' Dream, situated south of the New Golden Gate Mine, at Mathinna, and on ground formerly held by the South Gate Co. The prospectors, Messrs. Stevens and Dick, are old and well-known miners and prospectors. Their success in this instance is well deserved. The reef, which is very flat, underlying about 3 in 1, is from a foot to 14 inches thick, and has been sunk on from 15 to 20 feet. Ten tons of stone crushed yielded 50 ozs. of gold. Latest news received states that extraordinarily rich stone has recently been struck in this mine.

Magazines.—Since it has become part of my duties to inspect magazines generally, those outside the mining places as well as those within, a good deal of extra travelling is entailed. I find that but very few of the storekeepers who stock explosives above the 35 lb. quantity allowed, have magazines, or, indeed, any proper means of storing large quantities. Several new magazines have been built, and others are in course of erection. There are some 30 private magazines altogether; two-thirds of these are on mines or mining townships, the remainder in agricultural centres and sea-port places. The Magazines on mines and mining places are all in good order.

New Rules, and Duties of Inspectors.—Situated as I am in this extremely out-of-the-way corner of the mining divisions allotted to me for inspection of mines, and with the Mount Cameron Government Water-race to manage, I find it most difficult to perform the duties allotted to me in a satisfactory way. Mine inspection, to be put to its best use, should be performed frequently, and the Inspector should reside in the most centrally-situated place, so that all or any of the mines could be reached with the least possible amount of travelling. Periodical rounds of inspection, such as I make, occupy from four to five weeks, and cost far more in the way of travelling expenses than if I were to return to my home weekly or fortnightly. Recently, questions have been asked in Parliament—"Do Inspectors of Mines notify mine managers of their intending visits to their mines"? Personally, I can say that I do not now, nor have not at any time given notice to any mine manager of my intention to visit and inspect the mine of which he had charge; nevertheless, I know full well that they can find out when I am coming. Coaches travel through most mining places daily, and news of the Inspector's movements travels with them; newspapers also contain this information at times, although they do not get it from the Inspector. Since the close of the year, I am glad to learn that it is the intention of the Hon. the Minister of Mines to relieve me of the management of the Mount Cameron Water-race, so that I may reside in a more centrally-situated place, and devote the whole of my time to mine and magazine inspection.

Inspection of Mines by Workmen.—The Chief Inspector of Mines has forwarded me extracts from the Mining Acts of Queensland, New South Wales, and New Zealand, in each of which provision is made for inspection of mines by workmen. I am glad to be able to recommend that a similar provision be embodied in our Mining Act, as I feel sure the introduction of such a principle would be of great assistance to the inspection, and materially aid in securing increased protection for miners. Especially would this apply to cases where the Inspector is unable to make frequent inspection of mines, in which more than ordinary danger of accidents exists. As a rule, miners do not care to complain to the Inspector of dangers or defects that may exist in the mine they work in; formal complaints are seldom made. Again, where accidents not fatal but of a serious nature occur, and are reported to the Inspector by the mine manager, it often happens that he, the Inspector, is not near enough to investigate the cause of such accident without delay, and determine whether blame for its occurrence is attachable to any one—days may elapse before he reaches the locality; in the meantime, work is going on, and thorough investigation rendered more difficult. Inspection by workmen would obviate this. In New South Wales, where such inspection applies to metalliferous as well as coal mines, and where appointments are made by workmen in a mine choosing two of their number, or any two competent persons, to inspect, the measure seems to work very well. I am not in favour of the New Zealand Act, which provides that not only the workmen employed in the mine, but if any of them are members of a union registered under the Industrial Conciliation and Arbitration Act, this union may appoint two persons, whether employed in the mine or not, to make an inspection of every part of the mine once a month. As inspection by workmen will, if introduced in this State as in New South Wales, mainly apply to collieries or the larger metalliferous mines, I think it would be better for the men in any mine, whether unionists or not, to appoint two of their number, or any two competent persons, to inspect and report to the manager of such mine; he, in turn, to forthwith forward a copy of such report to the District Inspector of Mines.

LIST of Accidents in Inspector Griffin's District for the Six Months 1st *July to* 31st *December*, 1908.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
27 July	New Golden Gate	Mathinna	Fall down ladder-way	Thorne, Daniel	Married	Slight cuts	Fell down about two lengths of ladders in a rise.
27 July	Ditto	Ditto	Fall of earth	Solomon, Joseph	Ditto	Slight cuts to head	Working in open cut mullock face, and was caught by a fall of loose earth.
6 Aug.	Marialva Coal Mine	Colebrook	Fall of rock	Olsen, Christian	Single	Bruises	Removed a prop, which he was cautioned not to do, and some of the roof fell on him.
10 Aug.	Star of Peace T.M.	Ringarooma	Fall of stone in pass	Green, James	Ditto	Cuts on head, &c.; fatal	Was horse driver, and employed trucking stone from mine tunnel to battery. An ore-pass led from surface to tunnel, and Green was trucking ore from this pass. He was found in the pass with about a ton of stone and dirt on his head, and quite dead.
2 Sept.	New Golden King	Mathinna	Flying fragments of stone	Keltie, William	Ditto	Injury to eye	Working in winze. A splinter of quartz flew from pole of his pick, striking him in the eye.
30 Sept.	Anchor T.M.	Lottah	Falling stone	Trehee, Edwin Dudley	Ditto	Cut head, bruises back, right side, &c; fatal	Drilling holes at foot of main face; a large piece of rock came away from face and struck Trehee. He died 11th October.
9 Oct.	Pioneer T.M.	Bradshaw's Creek	Fall down face	Williams, Alexander	Ditto	Concussion of spine and internal injuries; fatal	Was trimming off overhanging portions of face after a fall of earth; went too near to edge, and fell over the face on to cement boulders about 30 feet below. Died

							it descended.
21 Oct.	Anchor T.M.	Lottah	Fall of rock	Quinn, John James	Ditto	Head and body crushed; fatal	Was face-boss at the open cut. When inspecting a part of face considered to be dangerous was caught by falling rock, and crushed to death.
27 Nov.	Tasmania G.M.	Beaconsfield	Jammed between trucks	Thomas, Jas.	Single	Bruised back and loins	Was pushing loaded truck along 718-feet level. The work was too much for him, and the truck forced him back and jammed him against another truck.
7 Dec.	Ditto	Ditto	Cut with adze	Tregaskis, John	Married	Cut leg	Was using an adze to do some carpentering; adze slipped, and cut his leg.
7 Dec.	Ditto	Ditto	Struck by tram	Wellington, Herbert	Ditto	Bruised by truck	Was trucking, and bruised himself whilst jumping on to a truck in motion, resulting in formation of an abscess.
24 Dec.	Tasmanian Consols	Mathinna	Fall in shaft	Burles, Edwd.	Single	Injuries to head and body; fatal	Was helping sink shaft below 1200-feet level; had ascended to level by bucket in ordinary way; in stepping from the bucket he missed his footing, and fell bottom of shaft, 85 feet below.
19 Dec.	New Golden King	Ditto	Machinery	Irvine, John	Ditto	Crushed finger	Taking a knot out of cage chain at surface; engine-driver let cage go before being signalled by Irvine, whose finger was crushed between chain and wheel.

Fatal, 5; non-fatal, 9; total, 14.

TABLE showing rate per thousand Killed and Injured in the different Mining Divisions for the Six months, 1st July to 31st December, 1903.

Period.	Division.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
				Killed.	Injured.			Killed.	Injured.
1 July to 31 Dec., 1903	Northern and Southern	535·5	5	—	5	5	9·337	—	9·337
Ditto	North-Western	373·0	—	—	—	—	—	—	—
Ditto	North-Eastern	666·5	2	2	—	2	3·000	3·000	—
Ditto	Eastern	890·0	7	3	4	7	7·865	3·371	4·494
Ditto	Western	3139·0	13	3	11	14	4·460	0·956	3·504
		5604·0	27	8	20	28			

Analysis of Statistics for the Western Division.

Division.	District.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
				Killed.	Injured.			Killed.	Injured.
Western	Mount Lyell	2027	7	2	6	8	3·947	0·987	2·960
	Zeehan, &c.	1112	6	1	5	6	5·396	0·900	4·496

REPORTS OF THE COMMISSIONERS.

Mr. Commissioner O'Reilly (stationed at Scottsdale) reports :—

At your request, I have the honour to submit a report for the six months ending 31st December, 1903, upon the state of mining in the North-Eastern Mining District.

Gold.

I regret that I am unable to report any substantial improvement in the state of gold mining in this district during the above period. Some very promising reefs were discovered in the Mt. Victoria locality, but the want of sufficient capital for the purpose of mine development retards much the progress of this field. Several claims are mined in a small way by co-operative parties of miners, who obtain remunerative returns.

A good deal of prospecting has been done at the Waterhouse field, which may lead to the development of the reefs in that locality.

Tin.

I have but little matter to refer to in this short period since my last annual report, but I may observe that steady and very satisfactory progress has been made in the development of the resources of the large deep alluvial claims. There has been an abundant supply of water, and on the whole, the yields have proved highly remunerative.

During the six months 820 tons of tin ore have been won and forwarded from this district, the number of miners employed being 500 Europeans and 135 Chinese.

On the whole, this industry in this district appears in a sound and permanent condition, and may reasonably be expected to continue so for many years.

Mr. Commissioner Fowell (stationed at St. Helens) reports :—

I have the honour to forward to you my report on the mining industry in the Eastern Mining Division during the six months ending 31st December, 1903.

Gold.

Mathinna.—I paid a visit to the mines in this portion of the district on the 23rd December last.

New Golden Gate.—Work was closing down for the holidays; but the manager was taking advantage of this being done to give a thorough overhaul of the machinery. He also informed me, that his company had determined to erect a thorough up-to-date pumping-plant, which is on its way, and on arrival will at once be erected. It is to be worked by electricity. The slide which threw the reef out of its natural course, still gives considerable trouble; but it means only careful prospecting when it is found to occur, and patience to pick up the reef again. Altogether, the life of this mine is now extended to an indefinite time, and under the management as at present carried out must prove dividend-paying.

The next most promising mine is the Volunteer Consolidated—this bids fair to rival the New Golden Gate. During the last three months, from 365 tons of quartz 420 ozs. of gold have been obtained, and as it must be borne in mind that during the period this has been done, there has also a very large amount of dead work been effected. If this company will abstain for the present from declaring dividends, and lay by a strong reserve fund to meet contingencies, there is great hope for its future. There are no less than four gold-bearing reefs within their lease, and strong reasons for two, if not more, forming at a depth a large body of stone. The natural features of the surface are excellent for a battery site, and any amount of space for the getting away of tailings. I was shown a splendid cake of retorted gold, 254 ozs., valued at £1000.

The Volunteer Consolidated Extended, formerly Yellow Boy, is adjoining the Volunteer Consolidated. Developmental work is being well carried out on this mine, and it should meet with success, as it is on the same line of country.

On the *Volunteer Mine* the battery has been extended by the erection of an extra ten head of stampers, and an additional 40 horse-power engine. This mine is well worked, but the manager has to deal with a low-grade stone. It is to be hoped that, provided the increased plant can be kept working, with decreased expense in treatment, the mine can be made to pay.

At the *New Golden King* 450 ozs. have been won from 1000 tons of quartz. Of course, if this can be maintained, this mine will quite come up to expectations.

Other mines who have had crushings are—*Dan's Claim*, 50 tons yielding 50 ozs. The *Revenue* obtained 6 ozs. I am not able to give the amount of stone crushed.

On other leases, prospecting is being carried on; namely :—*Loanes P. A.*, *City of Hobart*, *Tasmanian Consols* (late North Gate), *Golden Princess*, *No Call P.A.*, *Waterfalls*, *Reliance Claim*, *Kelly's P.A.*, *Tregurtha's P.A.*, and nine *Prospecting Claims*. Stevens and party are reported as having struck rich stone in the neighbourhood of the New Golden Gate, but I cannot say if it is likely to prove permanent; the country about there is broken, as instanced by the Golden Gate.

Mangana.—The only leases working are the *Golden Entrance* and the *Sovereign*. The former, from 41 tons of quartz, have obtained 38 ozs. 13 dwts.; and the latter, from 9 tons, 2 ozs. 3 dwts.

TIN.

Aroca.—The *Mount Rex Mine.*—This mine deserves every encouragement from the Government. Not only being on low-grade ore, they have also to contend with antagonistic metals, namely, iron and copper pyrites and galena. They have been obliged to bring in water from the Ben Lomond Swamp, and take up dam sites, for which they pay £100 per annum, in the shape of rent, to avoid these sites being taken up by blackmailers, who would have to be bought off. The company have raised 41¼ tons of tin during the last three months.

St. Helens.—The South Esk.—At present it is all alluvial mining in this neighbourhood, although there are indications of lodes, which I hope before long will be struck.

The Royal Ruby, *Thureau's Deep Lead*, and the *Hunt P.A.* are the leading companies.

Lottah and Blue Tier.—At the *Anchor Mine* during the last three months 64 tons 7 cwts. of tin have been raised, against 51 tons 10 cwts. previous quarter.

At the *Australian*, two men tributing have won 10 tons, and tributors on the *Cambria* 17 tons.

At the *Blue Tier*, on two leases, 1 ton 2 cwts.; and on seven miners' claims, 3 tons.

Weldborough.—The *Weldborough T.M. Co.*, late Laffer, have won 1 ton 9 cwts.; and the *Weldbrooke*, 1 ton 15 cwts. On R. B. Inglis' lease, 3 tons 3 cwts. by Chinese; and on other leases and miners' claims in this neighbourhood 29 Europeans and 60 Chinese have raised 26 tons 8 cwts.

I have now, Sir, as fully as I can, given you, as I believe, the true state of the mining industry in this district, which I am perfectly satisfied none but a Resident Commissioner could do. I now most reluctantly have to lay down my work, under circumstances over which I have no control. In doing so I have the assurance of the Honourables the Attorney-General and Minister of Mines, that I have performed my duties during the last sixteen years with efficiency, and consequently, feeling it impossible under present arrangements the work can be carried out with efficiency, even by the best men procurable, I trust that, when assistance is found to be necessary, my past services will receive the consideration I feel they deserve, and that I may be re-instated.

Thanking you and all connected with the staff at the Mines Office for great consideration shown to me, and every possible help given me in carrying out, especially for 13½ years, on the West Coast, arduous duties.

Mr. Commissioner CHAMBERS (stationed at Zeehan), reports:—

The work of the half-year under review can only be regarded as highly satisfactory, and the permanency of the Western Mining Fields as beyond question. In many instances a large outlay of capital, in the erection of additional plant for operating on an extended scale with the products of various mines, has been indulged in, and there can be no doubt, I think, that such expenditure has been amply warranted. On the whole, most of the principal mines never looked better than they have done of late, and the market-prices of metals having been fair, considerable activity has been noticeable. One very satisfactory feature has been the introduction by the local smelting company of processes enabling them to treat profitably many low-grade and refractory ores, which previously it was of no advantage to the producers to offer them.

Tasmanian Smelting Company, Limited.—From particulars courteously supplied by Mr. P. Kunze, co-manager, it is found that during a period of eleven months, commencing 1st July, 1903, this company's operations principally consisted of the purchase and reduction of lead-ores, the quantities and values being as follows:—Ore purchased, 24,134 tons, containing 7305 tons lead, 1,023,163 ozs. silver, 3406 ozs. gold; aggregate net value, £115,572. Ore smelted, 24,192 tons. Bullion exported, 7137 tons lead, 1,025,963 ozs. silver, 3469 ozs. gold. The company also purchased during the same period for fluxing purposes, 11,473 tons of iron ore, at a cost of £6884. Mining operations on a small scale were carried on by the company on its Owen Meredith and Sylvester sections, winning 86 tons of ore, containing 26 tons lead and 6973 ozs. silver, of the aggregate net value of £610. Average number of men employed in all operations, 170.

As the company's smelting operations are being considerably extended, the erection of additional plant, at a cost of several thousands of pounds, is now about to be undertaken, and the employment of a largely increased number of men at the smelters may be anticipated.

The Zeehan-Montana Mine.—The operations for the six months were as follows:—No. 1 shaft.—Winzes sunk 102 feet; rises put up 302 feet; drives and crosscuts driven 1375 feet; stoped 275,130 cubic feet. No. 2 shaft.—Rises put up 54 feet; drives and crosscuts, 1093 feet; stoped 960 cubic feet. The company employed, on an average, 200 men, and raised 1646 tons of marketable ore, of the net value of £20,589.

Upon the half-year's work and the appearance of the mine, the manager (Mr. John Craze) writes me as follows:—"The deepest level operating on the mine is 600 feet. So far, nothing payable has been met with at this level. Operations are being carried on in six levels simultaneously. There is still some years' reserve of stoping ground available, and the prospects, especially at No. 2 shaft, are very encouraging." The returns compare very favourably with those of previous half-years.

The Zeehan Western Mine.—A new company to work this mine having been formed in London, the property is now under the charge of Mr. Craze (of the Montana Mine), and operations to unwater the mine were commenced on 12th August last. By 26th November last the water had been taken out to the 600-feet level, and driving to cut the lode has commenced. Considerable additions and repairs to the plant have been undertaken, and the mine has provided daily employment for about 50 men.

The British Zeehan Mine continues to yield excellent returns, and is now looking well throughout. For twelve months to 30th June last, from 11,931 tons raised, 7424 tons of marketable ore were sold to the Tasmanian Smelting Company, Limited for £68,184, the ore-contents being, fine silver 536,656 ozs., soft lead 3816 tons. On an average 200 men have been employed, and the year's work principally consisted of the following:—Shafts sunk, 230 feet 6 inches; crosscuts, 996 feet 6 inches; drives on lodes, 3339 feet 9 inches; winzes sunk, 291 feet 3 inches; rises put up, 178 feet 6 inches; ground stoped, 8011 feet; total, 13,047 feet 6 inches.

At the *Oonah Mine*, which is still on tribute, 30 men have been employed, and for twelve months to 31st May last, 989 tons of ore, containing 56,208 ozs. silver, 28 tons lead, 47 tons copper, and 138 tons carbonate of iron, aggregating in value £5574, have been mined.

Three men on an average have been employed upon the *Silver King Mine*, where little work beyond surface prospecting has been done. Twenty-six tons gossan and 20 tons sulphides have been mined, the contents realizing £210.

Florence Silver Mine.—Owing to a serious inburst of water, no profitable mining work could be undertaken during the half-year; but since the difficulty caused by water was overcome, some very fair-grade ore, as well as a quantity of lower standard, has been won, 437 tons raised between December, 1903 and June last realizing £4088. Average number of men employed, 32.

The erection of a concentrating mill for treating low-grade ore, and with a capacity of 30 tons per eight weeks, having been determined upon, the construction work is well in hand.

On the *Nubeena Section*, Llewellyn's Imperial Tribute party kept an average of six men employed, and raised about 40 tons of marketable ore, which realised £407 5s. 6d. This mine is developing, and continues to look well. In the past six months some 400 tons of ore have been raised, and increased production in the near future is anticipated.

The work of the other mines in the vicinity of Zeehan does not call for special remark.

At Mount Dundas, the *Comet Mine*, between 1st July, 1903, and 31st May last, yielded an output totalling 6102 tons (concentrates 901 tons, galena 737 tons, flux 4464 tons), and of the aggregate net value of £12,191 14s. 10d. Seventy men, on an average, were employed.

The Penzance and *New Dalcouth Tin Sections*, at North-east Dundas, are properties which, during the half-year, received considerable attention. On the Penzance section surface prospecting by 4 men located a tin-bearing formation, after which a tunnel (now in 260 feet) was driven, payable tin being met with and other promising discoveries made. At the New Dalcouth Mine 5 men have been employed, and I am informed that about 300 tons of over 5 per cent. tin ore have been paddocked. The proprietors are industriously prospecting, to determine the size and length of the ore-body, in order to decide upon the capacity and class of machinery necessary to be erected for treating the ore won.

At the *Hercules Gold and Silver Mine*, at Mount Read, a very satisfactory half-year's work may be recorded. The development of the mine at the lower levels is proceeding, and the monthly output of gossan, zinc-lead, sulphides, and zinc ore has averaged 1300 to 1400 tons. A crushing-mill is about to be erected at the company's works at Williamsford. The mine appears to contain enormous reserves of low-grade ore, which, however, under the existing competent management, should continue to be operated upon on an extensive scale for many years, and in a fairly profitable manner. About 150 men, on an average, have been employed, and the number is likely in the near future to be considerably increased, as the company has now in hand contracts for the supply to the Tasmanian Smelting Company, Limited, of 130,000 tons of sulphide ore and 2500 tons of zinc ore, performance of which will involve a greater weekly output, and benefit the district and State generally to a considerable extent. The sum of £5406 18s. 6d. has been distributed in dividends since 1st August last, and the company has £5000 at fixed deposit.

At the *Mayne Tin Mine*, Mount Agnew, the work of developing the mine in a systematic manner has steadily proceeded, and the sluicing operations have resulted in an output for the past half-year of 36 tons 14 cwts. of tin oxide, giving the company a profit of about £1505. A first dividend of 1s. per share has been paid to the shareholders, and, as a fair weekly output from the mine continues, a good prospect of a further distribution of profits at an early date may be said to exist, as the property is being economically handled. Thirteen men have been constantly employed.

The proprietors of the *Federation Tin Mine*, at Mount Heemskirk, have employed three men in general prospecting, and also in cleaning out and re-laying tram-road in the lowest or 300-feet level, and they anticipate the early flotation of an English company to undertake the development of the mine.

A fair number of prospecting shows and miners' claims in the vicinity of Mount Heemskirk and at Comstock have provided satisfactory wages for several parties of miners.

The highly mineralised country at and contiguous to Mount Farrell must shortly, in my opinion, receive increased attention. Mining operations carried on by the *North Mount Farrell Company*, *The Mount Farrell Company*, and the *Murchison River Company*, and the examinations made by the late Assistant Government Geologist, have given convincing proofs of the possibility of converting more than one of the shows in this locality into highly payable mines—given the expenditure in a judicious manner of a reasonable amount of capital, and the application of the most approved methods of treatment. Up to the present time the *North Mount Farrell and Murchison River* mines have given satisfactory returns, and this portion of the district has provided daily employment for about 150 men.

It is gratifying to report that some activity again prevails in the Rosebery District, where extensive ore-bodies, though of complex nature, are known to exist. Owing to the ability of the Tasmanian Smelting Company, Limited, to now treat these ores at a profit, as well to the producers as to themselves, a contract for the supply by Mr. William John Hodge, tributor, from the Primrose Mining Company, of some 5000 tons of zinc-lead sulphides from the latter company's Rosebery Mine is now being executed. I am led to hope that ere long considerable additional quantities of ore from this district will be under despatch to the local smelting works, and that the various mining properties there, notably the large areas under lease to the Tasmanian Copper Company, which have lain practically dormant for too long a period, will be providing employment for a considerable number of individuals.

During the half-year marked attention has been paid to the Stanley River Tin Field, which extends over portions of Mount Livingstone and the Parson's Hood, and is distant 19 miles from Zeehan. Some 25 sections have been pegged for tin, and it is understood that capital to develop the more promising shows will be forthcoming. At present, the difficulties of access are not inconsiderable.

In the Lyell Division, the mining operations of the *Mount Lyell Mining and Railway Company, Limited*, naturally call for more than passing reference, and it can be said that the company's half-year's work was exceedingly successful and satisfactory. The amalgamation of the Mount Lyell and North Mount Lyell mining and railway interests having been smoothly carried out, since 11th August last both mines, together with the old Mount Lyell Company's subsidiary mining properties, have been under one management, the supreme charge being vested in

Mr. R. C. Sticht, the general manager, whose mine engineer, Mr. W. T. Batchelor, has had supervision of the amalgamated company's various mines. The work of placing the North Lyell Mine in thorough going order was at once undertaken and completed, and throughout the half-year regular daily deliveries of ore to the company's reduction works at Queenstown have taken place. At the latter works, 178,460¼ tons of ores and metal-bearing fluxes from the company's mines, and middle products from the Crotty Smelting Works, and 240¾ tons of purchased ores, were treated, the whole returning 3750 tons of blister copper. The latter, in turn, produced, approximately, as follows :—

GOLD, FINE.				SILVER, FINE.				COPPER.			
	Approximate value.				Approximate value.				Approximate value.		
ozs.	£	s.	d.	ozs.	£	s.	d.	tons	£	s.	d.
10,280	43,690	0	0	364,288	39,973	14	6	3706	223,019	0	11

or a total value for the half-year of £306,682 15s. 5d. The company has found daily employment for, on an average, 1993 men. The general manager's estimates of 19th April last of ore-reserves then in sight were as follows :—Mount Lyell Mine—4,495,310 tons. Average assay value—Copper, 0·59 per cent.; silver, 1·99 ozs.; gold, 0·04 ozs. North Lyell Mine (to 500-feet level)—170,494 tons. Average assay value—Copper, 6·25 per cent.; silver, 2·25 ozs.; gold, 0·005 ozs.

Mount Lyell Blocks Mine.—Satisfactory progress has been made towards the equipment of this mine in a manner necessary for dealing on a large scale with the company's deposits of copper-bearing clay. The old tunnels have been repaired, and two new tunnels have been driven. A concentrator, fitted with suitable puddling machinery, has been erected, and trial runs of the new plant have given satisfactory promise for the future. As an evidence of the confidence of the proprietary in the mine, it may be mentioned that during the period under review about £10.000 have been laid out in preparing the mine for a greatly increased weekly output. The concentrator is expected to treat 2000 tons of ore per week, and the mine manager (Mr. Nicholas) speaks in very hopeful terms of the prospects ahead. Number of men employed, 76.

At the *Crown Lyell* and *Tasman and Crown Lyell Extended* mines developmental work has been proceeding, the indications met with being sufficient to induce the management to continue energetic prospecting.

At the *Lake Jukes Mine* very thorough prospecting has been carried on under the supervision of Mr. H. S. Muir, formerly of the North Lyell Mine, and 5 men have been continuously employed. The efforts of the company certainly deserve success.

From Mount Darwin, and from various places in the vicinity of Queenstown, notably the Queen River, Lynchford, and Hall's Creek, rather increased quantities of alluvial gold have been brought in by prospectors, a good many of whom have been making fair wages.

The Zeehan School of Mines and Metallurgy, and the Queenstown Technical School and School of Mines, continue to prove of great benefit to the students of the district. The attendance is satisfactory, and each Institution is excellently conducted. At present, the Queenstown School is entirely self-supporting.

The geological survey of the Zeehan Mining Field, by Mr. George A. Waller, late Assistant Government Geologist, having been completed, lithographs of the surveyor's sketch-plan have been made available by the Department, and the same are proving very useful to those engaged in mining in the Zeehan Division, the Geologist's work evidencing great care and thoroughness, coupled with a comprehensive knowledge of his subject.

The applications for protection of leases and prospecting claims received during the half-year numbered 27.

Mr. Registrar Donohue (stationed at Waratah), reports :—

I have the honour to submit my report upon the mining industry in the Waratah Division during the six months ending 31st December, 1903.

The Mt. Bischoff Tin Mining Company still continue to keep up their usual output of 106 tons of ore monthly, with an average of 220 men employed. The Goldfields Diamond Drilling Company has just erected its boring plant, and it is intended to put several bores down on different parts of the mine, for the purpose of prospecting it at a depth.

The Mount Bischoff West Tin Mining Company.—This mine is still idle, pending more capital being raised to start operations.

The Waratah and *The Stanhope* alluvial claims still continue to send out about 1 ton of tin ore each, monthly.

At Badger Plains, the *Wombat Syndicate* has continued prospecting operations on its sections, with very good results, and it is now busily engaged erecting an hydraulic sluicing-plant, which will enable it to work its ground very cheaply. Other sections in the vicinity of Wombat Mine are being worked by different prospectors, with a fair amount of success.

The Magnet Silver Mining Company.—The output of ore from this mine has been kept steady at 1000 tons per month for the whole period. The grade has been good, and the whole has been sent to Dapto and Cockle Creek Smelting Works, New South Wales. The principal underground work has been the sinking of a main underlay winze, fitted with a "Cameron" pump, and air-winch. The shaft is now down 70 feet, where they intend to open out for the purpose of cutting the lode. An air-compressor and Pelton-wheel is installed, providing motive power for the machinery at the shaft. There are now 140 hands employed at this mine.

The Godkin Silver Mine, Whyte River.—The drainage tunnel has been completed, and they have now started to rise from the 90-feet level to the 45-feet level, on a lode 11 feet wide, and have now about 50 tons of second-class ore stacked in their paddock on the surface.

The Godkin Extended Silver Mine, Whyte River.—A crosscut has been driven for 524 feet, and coming into hard country, work was suspended. Have since started working in the winze, on a nice body of metal, showing 3 feet wide.

The Confidence and Washington Hay mines are still idle, but are expected to resume operations at an early date.

The Long Tunnel Syndicate (formerly Mt. Stuart).—This syndicate has continued operations, and has now about 150 tons of high-grade silver-lead ore stacked in its paddocks. Arrangements are now being made for the construction of a tramway for a distance of about 5 miles, to connect with the Waratah-Corinna road, and it is considered to be the most promising mine in the district.

The Wealth of Tasmania (copper, Heazlewood).—The crosscut from the main shaft has been extended 20 feet, making a total to face of 125 feet, when work was discontinued. An open-cut has been put across the lode, and sunk on for about 10 feet, showing some very nice-looking copper ore. There are about 40 tons of ore at grass, of various grades.

NOTE ON JACUPIRANGITE IN TASMANIA.

By W. H. Twelvetrees, F.G.S.

The wonderful aptitude of the alkaline magmas for differentiation is strikingly exhibited by the nepheline rocks at Port Cygnet. The promontory at the Regatta Ground south of the jetty consists of a central spur of elaeolite syenite. varying into alkali syenite, a light coloured alkaline eruptive of the character called leucocratic by Brögger, or salic in the new American terminology. The margins, especially the southern one, consist of the dark elaeolite-pyroxene rock known as jacupirangite. This locality name was given by Derby in 1891 to rocks in Brazil occurring as differentiation products in association with elaeolite syenite, usually laminated in habit and intersected by small dykes of the latter rock. The nepheline-pyroxene varieties pass into magnetite-pyroxene varieties and the latter into nearly pure titaniferous iron. This ore is found in Alnö (Sweden) connected with elaeolite syenite.

Megascopically, the Port Cygnet jacupirangite is a dark, medium-grained rock, speckled with elaeolite, and glistening with small brilliant crystals of augite. Under a magnifying glass a little iron pyrites is visible. The colour of the rock grows lighter as it merges into elaeolite syenite. The specific gravity is 2.89. Microscopically. the respective quantities of augite and elaeolite present do not differ much. The augite is green, slightly pleochroic, c : c 35°. The elaeolite is in large hypidiomorphic plates. Sphene in fair quantity in wedge-shaped crystals. Melanite garnet, which is characteristic of all the Port Cygnet eruptives, is not absent from this, and is occasionally rather plentiful. Apatite is present in the forms of prisms and grains. Magnetite is scattered grains. A little brown biotite. In order of quantity, the minerals are elaeolite, augite, sphene, garnet, apatite, magnetite, biotite.

Professor H. Rosenbusch, in mentioning that this is a quite typical jacupirangite, says that search ought to be made in it for the rare mineral baddeleyite (dioxide of zirconium), which has been found in a Brazilian occurrence of the corresponding rock.

Both Rosenbusch and Zirkel treat this rather peculiar class of rock as a modification of elaeolite syenite. Mr. H. Stanley Jevons includes it in the family of ijolites (pyroxene-felspathoid rocks), presumably owing to its mineral composition. As a rule, however, ijolites are much poorer in titanic acid and iron than jacupirangite.

At Port Cygnet the rock cannot be called a geological entity. It does not occur as a dyke of later material invading the main mass of syenite. It may rather be interpreted as resulting from differentiation by progressive crystallisation, the marginal parts of the cooling mass receiving concentrations of basic oxides, while the centre was left more acid. The minor variations are interesting; thus, vein-like bands of elaeolite syenite may be seen ramifying in the jacupirangite, and the latter also occurs as segregation spots enclosed in the lighter coloured rock. The central portion of the magma naturally consolidated after the cooling of the periphery.

The concentrations of iron ore into which the Brazilian rock merges have not been noticed at Port Cygnet; in fact, our rock is not at all rich in magnetite or ilmenite. The augite, too, is evidently not titanic. The titanium in the rock would appear to principally reside in the sphene.

NOTES ON TASMANIAN MINERALS

By W. F. PETTERD.

THE present paper records the more recent results of the continued investigation into the mineralogy of this State, from which it will be found that not only are several unrecorded localities enumerated for minerals which have been previously catalogued in former contributions on the subject to this Society, but also that not less than 13 species are now added to a remarkably long list.

Two peculiar chemical varieties of well-known substances are for the first time described, both of which are from one locality, and owe their unique features to a common cause. Several of the species are of special interest to the geologist, and a few are of commercial importance; but it may be needless to say that mineralogy deals with a variety of substances usually placed under that particular branch of scientific investigation, irrespective of their individual intrinsic value. In fact, by far the major portion but interest the geologist, the chemist, and those in search of some of the most beautiful of Nature's treasures.

So much is now known of the mineralogy of this State that the flood of discovery in this particular field is without doubt past, and it is only by the most strenuous efforts, coupled with close application, that additions to the minerals already known to occur can be made; but, needless to say, as to peculiarities of occurrence and chemical analysis much remains to be done.

I have to express my most grateful thanks to many friends for ready assistance as in the past, and generous donations of both beautiful and interesting material for this addendum, as well as for facilities for collecting and opportunities for the examination of many minerals *in situ*.

To Mr. R. F. Waller, General Manager of the Magnet Silver-mining Company, who is a most enthusiastic mineralogist, I am specially under obligation, both for collecting at his particular locality, as well as for assistance in the identification by blowpipe and other determinations.

1 ALBITE.—(*Polysilicate of aluminium and sodium.*)
In solid irregular milk white subtranslucent compact masses, apparently of secondary origin. **Locality**: Heazlewood River.

2 **Allophane.**—(*Hydrate silicate of aluminium.*)

Found as irregular, fairly large masses, outwardly coated with a pulverulent white powdery substance of secondary origin. The colour varies from pale yellow to a much darker shade. The general appearance of the mineral is remarkably gum-like. The composition is quite unusual, but there is little doubt about the identification.

Analysis by Mr. Watson, of the Magnet Silver-mining Company:—

$Si\,O_2$ = 19·00
$Al_2\,O_3$ = 40·40
$Fe_2\,O_3$ = 4·70
$Ca\,O$ = ·69
$S\,O_3$ = 1·61
Ignition = 33·30

99·70

3 **Antimony** (*Native.*)

Occurs in thin radiating patches, about an inch in diameter, on a silicious gangue. This is the first record of the occurrence of this somewhat rare mineral in this State. I have only seen one specimen, and that is in the collection of Mr. R. F. Waller, although I am informed a slab about a foot square was obtained, practically covered with the radiating metal. Locality: Spray Section, British Zeehan Mine, Zeehan.

4 **Apatite** (*Phosphate of calcium.*)

As very minute crystals, about two millimeters in length, of a pale pinkish colour, abundantly scattered throughout a stanniferous granite. Crystal Hill Mine, Blue Tier.

5 **Arragonite** (*Orthorhombic carbonate of calcium.*)

Occasionally obtained in vughs in basalt as subradiating thin columnar crystals, which do not rarely exceed 2 inches in length. They are highly polished, glassy clear, and colourless. This is by far the finest occurrence of this mineral in the State. Locality: Briseis Mine, Derby.

6 **Beresowite** (*Chromate and carbonate of lead.*)

This mineral has been found to be much more abundant at the Magnet Mine than hitherto supposed. It occurs in the decomposed or superficial portion of the lode, and is confined to cracks and small vughs in the gossan, where it forms coatings of almost microscopic plates and crystals, which often nestle in little bunches. The crystals are bright and sparkling, usually a shade of yellow to orange, but sometimes a bright crimson. It commonly decomposes to a yellow lead oxide. In the abandoned workings of the old Whyte River Silver Mine, Mr. R. F. Waller obtained some nice slabs of a decomposed rock, literally coated with the characteristic crystals of this substance. Its bright colour renders it an attractive object, but the soft base upon which the crystals are usually implanted causes it to be extremely difficult of transport. It has not so far been noticed at any other of our silver-lead mining localities. In fact. its occurrence in the Heazlewood district appears to be the first outside its original locality at Berezov, in the Ural.

7 CASSITERITE (*Dioxide of tin.*)

Occurs of unusual habit at Mayne's Mine, Heemskirk. The colour varies from a pale dull grey to almost black, and is commonly of a radiated fibrous structure in botryoidal and reniform shapes. Where the concentric structure is well defined, the internal coloration is in bands of regular width, of various shades of grey to brown. In all essential characteristics this occurrence exactly corresponds with what is known as "wood tin" in Cornwall. England.

An acute pyramidal, intensely black variety, representing what has been termed sparable or "needle" tin in the European mining districts, occurs at Welsh's tin find near the five-mile on the Waratah-Corinna-road. The crystals are minute, very pointed, and a good imitation of the old-world form.

A remarkable occurrence of cassiterite has recently been discovered at Mount Bischoff by Mr. Bradford, in which cellular cavities, retaining in most instances the form of orthoclastic felspar, have been lined, and sometimes completely filled, with a mass of minute, well-developed, tetragonal tin crystals, combined with pycnite. The cavities are small, but perfectly distinct. The original porphyry has been almost completely topazised, simply leaving granular interspersed quartz. The replacement of the felspar with cassiterite is not so complete as that recorded from the Mount Rex Mine, where pseudomorphism has gone to the fullest extent.

In the Bischoff specimen the two minerals, pycnite and cassiterite, form a coating in the cavities, and it is but rarely the whole space is filled with the substitution. The intensely black cassiterite, with the milk-white base, forms a striking contrast of considerable interest.

The occurrence forms a remarkable illustration of the probable action on the original rock by chemical changes, by which the topazisation occurred, and the tin crystals were deposited in the cavities of dissolved orthoclase.

At the Stanley River numerous remarkably fine pseudomorphs of compact black cassiterite after orthoclase have recently been discovered. This replacement shews the clearly distinct crystal outline of the felspar imbedded in an almost milk-white porphyritic rock, mainly composed of quartz and felted masses and radiating bunches of short and opaque crystals of tourmaline. This last-mentioned mineral is of an intensely dark-green colour, and belongs to the variety which has been named zeuxite, and which hitherto was supposed to be almost restricted in this island to Mount Bischoff. Pseudomorphs of this mineral also after felspar are somewhat abundant at the same locality.

Mr. R. F. Waller has shewn me a small specimen of topazised porphyry from Mount Heemskirk—a quite new locality for this mineral.

8 CHALCOPHANITE (*Hydrated manganese and zinc protoxide.*)

In aggregates of well-formed tabular crystals of a bluish-black, and highly polished. Locality: Magnet Silver Mine, Magnet.

9 CHRYSOBERYL (*Aluminiate of beryllium,*) variety *Alexandrite.*

A remarkably fine example of this highly-prized gem stone was obtained by Mr. J. A. Thompson at the Weld River in stanniferous drift, during the ordinary streaming process of dressing tin ore. It is of a somewhat pale but attractive green colour, red by transmitted light, as is characteristic of the variety. It was by the kindness of Mr. Thompson tested with the dichroiscope by Mr. W. H. Twelvetrees, Government Geologist, with the result that its identification was placed beyond doubt. It is remarkable that this is the first cut specimen which has come under notice. In all probability this gem has been looked upon as a pale, transparent corundum, which is comparatively abundant at the locality, as is also the zircon.

10 CHROMIFEROUS MIMETITE (*Arsenate of lead with chromic acid.*)

This variety never assumes the barrel-like shape so common to the typical mineral. It is found in short hexagonal prisms and plates with basal terminations, usually about 1 millimeter in breadth and length. The colour varies from a decided brownish-green to deep orange; it is shining and opaque. The streak is orange to siskin-green. Before the blowpipe in salt of phosphorus it remains green when cold in both flames. In closed tube with splinter of charcoal and heated intensely it gives very strong and characteristic reactions for As. O, : with cupric oxide gives flame reactions for Cl., and in closed tube with magnesium wire the odour of $P_2 O_5$. It is reduced to metallic lead with soda on coal. This is a variety sufficiently distinct in composition, colour, and habit to be worthy of record. It is rarely met with at its only locality, and then in comparatively small groups of crystals, but its peculiar colorization, combined with the habit of usually occurring in thin plates, at once arrests attention. The chemical reactions shew that it is more allied to mimetite than to pyromorphite, a chromiferous variety of which has been recorded. Locality: The Magnet Mine, attached to the gossan in the superficial workings.

11 CHROMIFEROUS CERUSSITE (*Lead carbonate with chromic acid.*)

This attractive variety of a common species is, so far as known, confined to the Magnet Mine, in the upper workings of which it is, although local, fairly abundant. It occurs in fractures and vughs in the gossan zone, but in bunches and sparsely attached as beautiful little crystals, generally in close association with crocoisite, but never, so far as observation has gone, intermixed with the normal form; although this is somewhat abundant in its usual adamantine characteristic habit, often shewing remarkably perfect development in stellar and cruciform triplet crystals.

It is noticeable that, while the variety under review is invariably associated with the chromate of lead, the common type is rarely, if ever, obtained in the vicinity. It is always opaque, with a shining lustre, but not adamantine. The colour is canary yellow, with an occasional tinge of red where the crystal has impinged upon the chromate. The tint does not vary to any serious extent, although paler examples are occasionally met with. It is a most attractive mineral, and soon arrests attention. Its most constant feature is its crystallisation in flatish frondose and spear-headed groups, twinned by repeated angles across different faces of the prism (110). The striated faces of the twinned groups are the brachyprisms 011 and 013; these are commonly deeply grooved, affording a most interesting leaf-life and unfamiliar appearance.

This variety is perfectly distinct, both as regards colour and habit of crystallisation. Moreover, intermediate variations between it and normal type have not been met with. It is undoubtedly one of our most attractive and typical minerals. Under the blowpipe gives reactions for chromic acid.

12 DOLOMITE (*Carbonate of magnesium and calcium.*)

A somewhat unusual occurrence, in the form of small attached, doubly-curved or saddle-shaped crystals, which are opaque and white. Magnet Silver Mine, Magnet.

13 DIOPSIDE (*Metasilicate of calcium, iron, and manganese.*)

This almost white variety of pyroxene occurs, both massive and crystallised, at the Tenth Legion Mine, Comstock District. Analysis:—

$SiO_2 = 52{\cdot}1$

$Al_2O_3 = 3{\cdot}0$

$MgO = 15{\cdot}0$

$AuO = 27{\cdot}7$

$FeO = 2{\cdot}3$

$100{\cdot}1$

Specific gravity 3.23; hardness, about 6. (G. Waller: Report on the iron and zinc-lead ore deposits of the Comstock District, 1st February, 1903.)

14 DUFRENITE (*Basic ferric phosphate.*)

Occurs as a thin incrustation of an olive to blackish-green colour on zinc-bearing gangue at the Bell's Reward Mine, Heazlewood.

15 **EMBOLITE** (*Chlorobromide of silver.*)
In minute but perfectly cubical crystals, which are occasionally octrahedrous. Occurs in a seam of gossan at the Magnet Silver Mine, Magnet.

16 **FELSPAR** (*Polysilicates of aluminium potassium, &c.*)
The following note on this important group is kindly supplied by Mr. W. H. Twelvetrees, Government Geologist:—

Orthoclase occurs in our granites, syenites, elvans, and quartz porphyries. The most common com- combinations are (010), (110), (001). Car'sbad twins [twinning plane parallel to the orthopinacoid] (100) are frequently seen. The crystals are generally turbid from decomposition into kaolin, or muscovite. Replacement by pinite chlorite, &c., has occasionally taken place. Porphyritic crystals of an inch or two in length are common in the granite of the East and North-East Coasts.

Sanidine.—This pellucid monoclinic felspar is found in the alkali syenites and elaeolite syenite porphyries of Port Cygnet. It frequently shews zonal structure.

Plagioclase Felspars, albite, oligoclase, andesine, labradorite, bytownite, anorthite, form a continuous series, in which, according to Tschermak, albite and anorthite are opposite extremes. The intermediate felspars have been shewn by Schuster to be isomorphous mixtures of albite and anorthite.

Albite occurs as replacement of the groundmass of porphyroids or keratophyres at Mount Read; in larger crystals in the actinolitised slates in the North Dundas District. Intergrown with orthoclase, it forms microperthite; seen in granite at Anderson's Creek and in alkali syenite at Port Cygnet.

Labradorite is the felspar of our basalt and dolerite (diabase). Labradorite-bytownite and bytownite-anorthite felspars characterise the gabbros at the Heazlewood, Bald Hill, &c.

Oligoclase, with its narrow twin lamellae, is the plagioclastic felspar of our granites. Andesine occurs in essexite at Port Cygnet.

Microcline, though chemically identical with orthoclase, is triclinic in crystallisation. Basal sections microscopically shew a characteristic cross-hatched twinning, due to the intersection nearly at right angles of the twin lamellae of two types (albite and pericline). Seen in granite porphyry at St. Marys, and in granite elsewhere.

17 GALENITE (*Sulphide of lead.*)

At the Magnet Silver Mine somewhat fine pseudomorphs of this mineral, after sphalerite, have occasionally occurred. They are usually in irregular groupings, with drusy surface and glimmering lustre.

18 GÖTHITE (*Hydrous sesquioxide of iron.*)

Occurs sparingly, usually as a coating, at the last named locality.

19 HISINGERITE (*Hydrated ferric silicate.*)

In amorphous masses of an intensely black colour, with a conchoidal fracture.

In lode matter exposed in the lower tunnel of the Comstock Mine, Comstock District. (Mr. G. Waller, loc. cit.)

20 HORNBLENDE (*Bisilicate of various protoxides and peroxides.*)

The common black amphibole, containing aluminium, or paragasite, with the non-aluminous species tremolite and actinolite, have already been recorded (Catalogue of the "Minerals of Tasmania, 1896"), but there are several others occurring here which have not so far been satisfactorily identified.

At the Hampshire Hills a remarkably developed black amphibole occurs. It is in large crystals, which often reach several inches in length, and is closely associated with pyrophyllite and amethyst. In thin section under the microscope it is dark sombre green and yellowish-green according to the orientation. Intensely pleochroic $\mathfrak{c} = \mathfrak{b} >> \mathfrak{a}$. Extinction angle about 14°. Crystallisation irregularly prismatic and flaky, structure poicilitic, enclosing apatite, fluor, iron oxide, &c., and pierced with quartz grains; often surrounds felspar plates. Professor Rosenbusch, in a letter under date January 12, 1899, mentions this mineral as "a peculiar weakly bi-refringent monoclinic amphibole, bluish-green in colour; $\mathfrak{a}$ grey-green, $\mathfrak{b}$ brownish-green, $\mathfrak{c}$ bluish-green to blue, 2 E (the apparent optical axial angle) small, optical character + and with strong dispersion of the axes. It recalls strongly the blue-green amphiboles of the crystalline schists in the Scora Vale, in the centre and north of Norway, and elsewhere."

The series of phonolitic rocks of Port Cygnet afford one and perhaps two species of soda amphibole, but their specific identification is attended with considerable difficulty. Many of the rocks referred to have been microscopically examined by Professor Rosenbusch, and that well-known authority, in a communication to Mr. W. H. Twelvetrees, refers to one of the hornblendes as being barkevekitic. This is the prevailing form which is seen in rock sections from the locality indicated. It is myrtle green in colour by transmitted light, and in the absorption $\mathfrak{b} > \mathfrak{c} > \mathfrak{a}$, in this respect appertaining more to kataforite, but differing in the pleochroism. In the fractures and joints of the elaeolite syenite from the same place a black amphibole is occasionally developed, having much the general appearance of arfvedsonite. It is usually plentiful, occurring as long narrow thin laths and aggregates, sometimes reaching a trifle over 2 inches in length; they do not shew terminations, but have an irregular brittle structure. Fragments examined under the microscope shew the substance to be green by transmitted light. It is apparent that the soda hornblendes at Port Cygnet differ in some degree from those recorded from similar rocks in better known localities, and that they require further investigation before they can be satisfactorily determined.

21 HISTRIXITE *(Sulphide of bismuth and antimony.)*

This mineral occurs massive at several of the North-East Dundas mines, where it is classed under the common designation of "Fahl ore," a term applied to several very distinct minerals with the general physical characters of tetrahedrite.

22 HYALITE *(Hydrated silica.)*

Occurs in cavities of a hard lode gangue in white to pale-green botryoidal masses. Locality: Bell's Reward Mine, Heazlewood.

23 HYDROCERUSSITE (*Basic lead carbonate.*)
In one of the adits at the Hercules Mine, Mount Read, a white fluidal substance was observed in decomposed lode matter, which, on giving up its hygroscopic water, assumed a silvery-white appearance, and which under the microscope is resolved into very minute scales, but with little or no hexagonal structure. In all essential respects the substance agrees with this species as detailed in "Dana's System of Mineralogy, page 299.

24 LEPIDOMELANE (*Potassium mica rich in iron*)
Occurs in large sixsided tables, occasionally 1 inch in breadth, of a black colour, and highly adamantine. Transparent in very thin laminæ, shewing a beautiful emerald green colour. The crystals for the species are remarkably fine, and well developed; they are found aggregated together in association with a peculiar amphibole and quartz, and evidently form portion of a contact on the fringe of granite. Locality: Hampshire, near the old silver mine.

25 PHLOGOPITE (*Magnesium mica with little iron.*)
"This mineral occurs on Section 5367-93M in hornstone, associated with very large bodies of magnetite and zinc-blende. It occurs in large hexagonal crystals, with a very perfect micaceous cleavage. The colour is light green, varying sometimes to greyish-brown." (Mr. G. Waller, loc. cit.)

27 PYRARGYRITE (*Silver sulph-antimonite.*)
Ruby silver ore has recently occurred at several mines, notably at the Magnet, where it is not by any means rare in patches and blebs in close association with galenite. The mineral is sometimes surrounded by frondose and granular native silver, and the combination, needless to say, adds materially to the silver assay value of the ore. At the Mount Stewart Mine it occurs sparingly, and in small vughs little nests of micro-rhombohedral crystals have been detected, which are probably this mineral. At the Mount Farrell Mine it has been noticed embedded in galena; also at the Confidence Mine, near Waratah, and at the Hercules Mine, Mount Read, it has been seen in micro-crystals attached to filaments of native silver. Reported to have been found at the Oonah and British-Zeehan mines at Zeehan.

The light ruby silver ore (proustite) is sometimes associated with the pyrargyrite; the latter appears to be the more often noticed, but the exact determination of the species has not been made in the majority of occurrences.

28 RESTORMELITE (*Hydrous silicate of aluminium and iron.*)
As at its original locality, Restormel Mine, Cornwall, this substance occurs as a coating on psilomelane and other manganiferous material. It is white to pale-greyish blue, sometimes almost a clear blue. The incrustation is invariably thin, but quite noticeable and distinct. Locality: The Comet Mine, Dundas.

29 SILVER (*Native.*)
Some extremely fine examples of this native metal have recently occurred in the carbonate lode at the Hercules Mine, Mount Read. The mineral assumes most attractive nests and layers of extremely fine wire-like filaments, often with fern-like expansions, commonly implanted on a glistening, pure white, fibrous cerussite. The occurrence is by far the finest of its kind hitherto found in this State.

30 TURGITE (*Hydrous sesquioxide of iron.*)
An iron ore with the general aspect of fibrous hornstone, with a red streak. Hardness = 5. 6. Locality: Blythe River.

31 XANTHOSIDERITE (*Hydrous sesquioxide of iron.*)
Found as an incrustation, often in silky needles of a bright red colour, but sometimes in the powdery form. Occurs in the lode on gossan and other gangue. Locality: Magnet Mine, Magnet.

JOHN VAIL,
GOVERNMENT PRINTER, TASMANIA.

TASMANIA

REPORT

OF THE

SECRETARY FOR MINES

FOR

YEAR ENDING DECEMBER 31

1904

Including Reports of the Inspectors of Mines, Government Geologist, Mount Cameron Water-Race Board, &c.

Tasmania
JOHN VAIL, GOVERNMENT PRINTER, HOBART
1905

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REPORT OF THE SECRETARY FOR MINES.

Mines Department, Hobart,
3rd September, 1905.

SIR,

I HAVE the honour to submit my Report upon the Mines Department and the progress of the Mining Industry for the Year ending 31st December, 1904.

The preparation of the Report has been delayed, owing to the very great demand made upon my time during the present year in preparing, by your instructions, suggestions for the Mining Bill, 1905, and in collaborating with yourself and the Parliamentary Draftsman in connection with the Draft Bill, and also in attending at both Houses of Parliament for the purpose of rendering assistance to Ministers and Members of Parliament during the debate upon the Bill.

GENERAL REMARKS.

The aggregate value of minerals and metals raised in 1904 was £1,411,192. Owing to Federation, returns of quantities and values exported ceased to be obtainable from the Commonwealth Customs, and this, to some extent, dislocated the system of compiling the statistics of the industry. Owing, doubtless, to this cause, there was in the third quarter of the year a sudden fall of £80,000 from the totals of the previous quarter. The industry now is unable to take credit for the higher values of metallic exports, the figures being restricted to statistics furnished by mine owners and managers. These statistics are obtained in a variety of ways, and there is reason to fear that they are not absolutely complete, and that some of the mineral won by prospectors, tributers, and others is not accounted for in the official returns. With a view to providing a remedy for this, a section has been introduced into the new Mining Bill, making it obligatory on mine owners and managers to furnish a quarterly return of output and value to the Department.

There has been no diminution in the number of men engaged, the figures being 6194 in 1904, against 6017 in 1903; and as the market prices for metals ruled higher last year than in 1903, there is some reason for believing that if the same system of compilation had continued, a decided increase in the value of mineral returns would have been shown.

Work has continued regularly at the established mines in different parts. The mines in the Zeehan District have fully maintained their output. Increased activity has of late prevailed in the utilisation of low-grade material, which has been disposed of in large quantities to the Tasmanian Smelting Company. The Federation Company has secured the introduction of British capital into the Heemskirk District. The Western Mine at Zeehan has been re-started. The Primrose Mine at Rosebery has entered the productive list. An unfortunate strike at the Hercules Mine has interrupted the work there. This interruption still continues, but the shareholders in the company passed a resolution at the last half-yearly meeting recommending the resumption of work if it could be carried on at a profit. At the Mount Lyell Company's works, though the grade of ore treated has been lower, profits have increased, owing to metallurgical improvements and economies, as well as to the higher price for copper, which, at the beginning of last year, was £57 per ton, and is now £65.

It seems as if the mining work carried on at Lake Jukes, and recent discoveries of loose gold on Mt. Darwin, will attract more attention to the country south of Lyell. A battery is now being taken up to the Lake Jukes Mine. In the opinion of those qualified to judge, Mts. Jukes and Darwin are likely to become, in the future, important centres of mining.

The task which the new Tasmania Gold Mining Company, Limited, at Beaconsfield, has set itself in equipping its mine with powerful pumping plant, to enable it to cope with the heavy water and to exploit the reef efficiently and on a large scale, has been commenced, with strong auguries of success. The water is being kept under control, and the output of gold is highly satisfactory.

Some discoveries of gold at Lefroy have stimulated interest in this well-known field. There can be no question that the gold resources of the district are far from being exhausted, even at shallow levels.

The Mathinna District has its ups and downs, as is common to all goldfields, but it still boasts of the deepest gold mines in the State.

The market price of tin, which at the close of 1901 and 1902 was £103 per ton, reached £133 at the end of 1903, and £134 at the end of 1904. This improvement has been a prime factor in developing a gratifying increase of activity on all our tinfields. Those of the North-East and East Coasts are now receiving serious attention from Victorian and other investors.

Although continued and necessarily exhausting drafts have been made for many years on many of our best alluvial deposits, there is no doubt that there still remain extensive areas of drift which, with the actual market prices and the improved saving methods of to-day, can be worked profitably. The large, and it would seem almost inexhaustible, store of metal still locked up in the low-grade rock of the Blue Tier can only be satisfactorily realised by operations of a certain magnitude, combined with judicious arrangements respecting the motive power. It is worthy of note that some preliminary investigations of the problem are at present being made. Things have moved slowly in the Stanley River field on the West Coast. It is a district of great promise, but the difficult nature of the country and the surrounding conditions make successful prospecting a matter of time. In the Mt. Farrell District another silver-lead mine has been placed on the active list; and on the N.W. Coast, a few copper mines have been started, but are still only in their infancy.

Coal-mining has received an impetus, a few new properties having come to the front. Owing to favourable prices, wolfram has been mined in different parts of the State, and will doubtless continue steadily on a limited scale, so long as the market continues satisfactory.

APPENDICES.

Appended will be found the following Reports:—

Annual Report of the Mount Cameron Water-race Board.
Report of the Government Geologist.
Report of the Chief Inspector of Mines.
Reports of the Inspectors of Mines.
Report of the Registrar of Mines, Waratah.

GOLD MINING.

The production in 1904 was 65,921 ozs. fine gold, being 6033 ozs. in excess of that in 1903.

Beaconsfield.—This district returned 18,798½ ozs. retorted gold, and gave employment to an average of 616 men. A determined effort has been made to provide for thorough control of the water in the Tasmania Mine. The new pumping engines have a capacity of 6½ million gallons per 24 hours at normal working speed, or 8 million gallons at high speed, compared with about 3 million gallons of the old plant. In the exhaustive reports which have appeared on the mine, from 160,000 to 180,000 tons of quartz are estimated to exist above the 1000-feet level, and this quantity, it is hoped, will supply the batteries with 5000 tons a month for the three years required to sink and reach the reef at a depth of 1250 feet. It is pleasing to be able to note that the developments in the mine since the new company assumed control have been quite up to anticipations. The mine has, since its commencement, returned 598,168 ozs. gold from 530,451 tons of quartz. The total sum paid in dividends is £772,071 15s. There are indications that some of the outside mining propositions at Beaconsfield may be revived. Some of these have been neglected for some time. It is high time for a resuscitation of work on them. The North Tasmania has been in the hands of tributers for a long period, but the company is now arranging to resume control. There are rumours that the Tasmania West Extended is being refloated in London.

Lefroy.—The New Pinafore Company has definitely ceased deep work, after a long and persevering career, during which it has won 50,506 ozs. of gold, and distributed £71,500 in dividends. It is now engaged in shallow prospecting.

The quite recent discovery by prospectors of a gold-bearing reef at Lefroy has put new heart into the workers on the field, where mining has been languishing, in spite of pretty steady prospecting.

Mt. Victoria.—Continuous work on a small scale has been going on in this auriferous belt, but the destruction of the New Mercury battery by fire is a deplorable occurrence. Two batteries have now been burned down at Alberton. A little prospecting is always proceeding, but outside money is sorely needed to develop some of the numerous reefs on the mount.

Mathinna.—At the New Golden Gate Mine considerable trouble has been experienced in searching for the faulted reef, but when it is found the reserve of dividend-paying stone is expected to be greatly increased. This mine has yielded 214,544 ounces of gold, value £817,000, and divided £353,600 among its shareholders. The total quantity of quartz crushed by the company is 249,771 tons. Though gold-mining at Mathinna has not progressed so rapidly the last year as might have been anticipated, it is in a healthy condition. Outside capital, mainly British, has been introduced, and so far mainly expended in main shaft sinking, with a view of getting well below surface influences.

The British companies, the Tasmanian Consols, the City of Hobart, and the Tasmanian Gold Estates are engaged in sinking; the firstnamed is sinking below the 1300-feet level. The New Zealand company, the Eldorado, is also sinking a main shaft. English capital has recently been raised for working the O'Brien's group on the Dan Rivulet, and for the Queen of the Earth property on Hogan's Track.

Mangana.—The principal producer has been the Golden Entrance Gold Mine. This mine was let on tribute, and produced 658 ounces of gold from 352 tons of quartz.

The only other producers were the Golden Prince Mine, 6 ounces; Miami, 12 ounces; and the Tower Reefs, 23 ounces.

West Coast.—The usual alluvial mining in the Lyell District has continued. On Mt. Darwin good specimens of rough gold have been found, and this has stimulated prospecting. The source of the gold is not known definitely, but it is surmised to be some of the quartz and hematite formations which are met with on that mountain. Mt. Darwin, from its size, will absorb a vast amount of prospecting energy before any impression is made upon it;

but it is believed to have possibilities, the value of which it is impossible at present to estimate.

SILVER-MINING.

Zeehan.—This field not only holds its own, but is in an exceedingly sound and healthy condition. The active mines of Zeehan proper are the Mt. Zeehan (Tasmania), Zeehan-Montana, Zeehan-Western, Zeehan-Queen, Florence, Oonah, Silver King, Nubeena, Watt & McAuliffe, Silver Queen Extended, and New Mount Zeehan. The first two are the premier mines. The Western Mine has been unwatered, and is being opened up in depth. The discovery of a vein of clean galena at a depth of 800 feet, though not much in itself, is important as showing the persistence of the deposition of silver-lead ore below shallow depths on the Zeehan field, and furnishes additional confirmation of the favourable views expressed by competent authorities on the permanency of the ore deposits of this district. At Dundas and Mt. Read are the Comet, West Comet, Ring Valley, Red Lead, and Hercules Mines; at Rosebery, the Primrose Mine; and at Mt. Farrell are the North Farrell and the Murchison River Mines.

The Hercules Company raised about the same tonnage of ore in 1904 as in the preceding year, but the metallic values of the already low-grade and refractory sulphides have fallen off, in addition to which the European zinc market has failed it. The directors decided to suspend operations unless the mine could be made profitable. The now well-known attempt to reduce the wages rate resulted in a strike and the closing down of the mine for the time being.

The Primrose Mine is sending ores to the Tasmanian Smelting Company on, as it is understood, profitable terms, and arrangements have been made for a renewal of operations on the adjacent Tasmanian Copper Mine.

The North Farrell Mine has entered the profit-earning stage, and is yielding good returns. The Murchison River Mine in that district has commenced serious work, and is erecting a mill for the concentration of its ore.

The Tasmanian Smelting Company has been busily engaged smelting the ores of the field, and has introduced improvements in plant and metallurgical methods which will enable it to treat profitably larger quantities of the zinc-lead sulphides from the surrounding mines. It is also receiving large quantities of low-grade material from mine tips and tailings heaps, a step which is widely welcomed.

North-Western Division.—The Magnet Mine sent away 11,287 tons of silver ore for smelting during the year, and has employed an average of 120 men. A new mill for concentrating has been recently erected and started. The mine is being developed in depth, and the outlook is a favourable one. To date, 40,000 tons of ore have been raised and shipped.

In this district work has proceeded at the Long Tunnel, Washington Hay, and Godkin Mines. The Heazlewood and Whyte River localities are favourable for silver-lead ore, and can furnish employment for a good deal more capital than is being expended on them.

Silver-lead mining generally is in a prosperous state, and the markets are in favour of a continued bright outlook. The prices of lead and silver at the beginning of 1904 were £11 per ton and 2s. 2d. per oz. respectively, and at present are still firm at £12 15s. per ton and 2s. 3d. per oz.

COPPER-MINING.

The values of production of copper and copper ore have been on the up grade for 1904, exceeding the figures for the previous year by £105,467. The amalgamation of the Mt. Lyell and North Mt. Lyell Companies has proved itself to be sound policy. The furnaces have been supplied regularly with the usual quantities of ore (1100 tons a day), and the ore bodies on the various properties leased by the company have been systematically explored. The company is about to add the manufacture of sulphuric acid and superphosphate, &c., in Victoria to its operations, and for this purpose will ship the raw material from its mines in Tasmania. During the year the company smelted 406,433 tons of ore, producing 8371 tons of blister copper, which contained 8266 tons of copper, valued at £492,650 10s. 9d.; 816,643 ounces of silver (fine), valued at £89,875 12s. 3d.; and 23,391 ounces of gold (fine), valued at £99,411 15s. 0d.; a total value of £681,937 18s. 0d.

The amount paid in dividends by the company was £150,000.

The Lyell Blocks Company has developed its valuable deposit of clay charged with native copper. A concentrating mill for the treatment of the ore stuff has been erected, and was running the last four months in the year. During this time 17,154 tons of copper-bearing clay were produced, containing 212 tons of native copper, valued at £14,416.

Five or six other mines have been operating on the cupriferous schist formations at Lyell, but their work has been purely of a prospecting nature.

Copper-mining has been started on the North-West Coast, notably in the Stowport and Blythe Districts, where the Rutherford and Copper King Mines have been putting out ore. Development at these mines is still at an early stage, but vigorous work seems to be fully warranted. The ancient metalliferous schists and slates crop out in these localities from below the edge of the basaltic sheet which has formed the soil of the farm lands, so that agricultural and mineral areas exist side by side, a condition of things favourable for both industries. Other prospecting shows have come into existence, most of them along the same line of lode, but nothing of note has resulted from any of them as yet. The immediate future of the district as a centre of copper-mining apparently depends upon the success of the two mines named. Hardstaff's Copper Mine at the Dial Range is being developed; and some indications of copper ore at Rocky Cape and Boat Harbour have received a little attention.

TIN-MINING.

Owing to the rising market, matters have been very active in this branch of the industry. The largest producer has been, as usual, the Mt. Bischoff Mine, raising 1272 tons, and bringing the total production of this mine to 63,502 tons, and dividends amounting to a gross total of £1,967,500 have been declared.

The Briseis Mine raised 424 tons during the year; the Pioneer, 326 tons; the Anchor, 238 tons; Mt. Rex, 178 tons; the Scotia, 94 tons; the Arba, 81 tons. These, with Mt. Bischoff, are our most important individual mines, and are responsible for two-thirds of the tin output of the State.

The Pioneer Mine has increased its plant, and is in every respect in a flourishing state. The quantity of tin ore obtained during the year was 326½ tons. During the period dividends amounting to £17,550 were distributed among the shareholders, making a total of £49,725. The Anchor has been running on very low-grade stone, but working very economically. If the Blue Tier stone is to be treated successfully, the cheapest and most improved methods of mining and milling are indispensable.

The Mt. Rex Mine has maintained its output of ore, which it disposes of in the English market, and is carrying on exploration, with the view of locating the extension of its ore body.

The Briseis Extended Tin Mines, situate in the Ringarooma Valley, between the Briseis and Arba Mines, have recently begun work with a pumping plant of similar type to that at the Pioneer. The ground to be worked is stanniferous drift—believed to be a portion of the Ringarooma lead. It was partially worked 12 or 13 years ago by the Ringarooma Valley Company.

The South Mt. Cameron Company is also operating on drift near Gladstone. Results, which at first made success rather doubtful, have lately greatly improved.

The Gladstone Tin Development Company is preparing to dredge several miles of the Ringarooma River, below Gladstone. It has taken measures to prove the value of the ground by boring, and the result of actual work will be eagerly looked forward to. The Gladstone District is witnessing a general revival of activity. Work is being carried on on the Mussel Roe Fall by the Cybele Company, and the Inspector of Mines, who recently visited the locality, reported as follows: —"Two hand-boring plants are at work on this property in the vicinity of the old Garfield face. At the working-face several holes have been put down, to prove the depth of wash below the present floor, or working level. These vary in depth from 8 to 16 feet, and have proved the existence of rich tin gravels overlying the soft granite bed-rock. I am pleased to note that this prospecting work has proved something else besides the existence of good tin, viz., that the Government bores crossing this face towards the west end, and in which no payable tin was obtained, were true to the register, which shows that each bore was bottomed in soft granite bed-rock, and that the drift passed through was not of a payable nature. There are blanks in the Cybele Mine as well as in the other rich mines, and singular though it may appear, our line of bores struck one of these blanks, where the ground is poor and the bed-rock comes within a few feet of the surface. Mr. F. Krushka undertook to show that the Government bores were unreliable. Several bores were put down by him with, it is said, highly satisfactory results. Some of the Directors of the Cybele Company were not exactly satisfied with the nature of the soft granitic stuff that Mr. Krushka described as 'false bottom.' A party of men were put to work, and shafts or pits sunk near the bores, and bottomed at depths as already stated from 8 to 16 feet. In every instance it was shown that Mr. Krushka's bores had gone from 16 to 26 feet into the soft granite bed-rock. No tubing was used, and each succeeding auger carried down with it tin from the rich wash lying on the bed-rock; and thus did Mr. Krushka obtain excellent prospects from what he terms a 'false bottom.' I refer to this question of 'bed-rock,' or 'false bottom,' at the Cybele Mine because a great deal has been said, and some disparaging remarks made, about the way in which the Government boring operations were carried out. Even the press referred to the matter, and pointed out the difference in the results obtained by the Cybele Company boring with tubing, and that of the Government bores without tubing. It was the other way about, but newspaper correspondents ('Our Own') cannot always be trusted in matters of this kind. As we Civil Servants are not allowed to write to the press on matters of this kind, I respectfully submit that the Mines Department should contradict statements made by persons who do not hesitate to attempt to bring discredit on the Department or its officers when it suits their purpose to do so."

Good tin has been won from the old Lochaber Mine.

Boring work in deep ground has been proceeding in the neighbourhood of the Pioneer and west of Mt. Cameron; and sections at Mt. Stronach are receiving attention.

Similar activity prevails all over the tinfields of this part of the island, and given moderately seasonable weather, the effect must be felt in an increased output. Fortunately, these great areas of mountainous country and alluvial plain were wisely proclaimed by former Governments as mineral areas, and allotted to the mining industry for the benefit of the State; and within these boundaries no one can doubt that for generations to come the raising of tin ore will continue. Only, in course of time the alluvial deposits must inevitably become exhausted, and all the resources of the mining science of the future will have to be applied to the extraction of the mineral from the rock of the mountain ranges.

West Coast.—Eighty-nine tons of tin ore have been raised on the West Coast, an advance on the previous year by 15 tons. Large alluvial and lode tin deposits have been prospected on the Stanley River by the Stanley River Tin Mines Company and the Parson's Hood Mines Company, and more recently by the Maskell Company and others. Alluvial tin of great richness and in considerable quantity exists, and large lodes have been discovered, but a good deal of prospecting is still requisite before suitable sites can be selected for work. The country is heavily timbered, and the sources of the richest alluvial are still being sought. The district is one that can be recommended to the attention of investors.

Heemskirk is a district which is only now recovering from the effects of the foolish expenditure of the old days. Mayne's Mine is producing steadily, and the Federation property, which has large bodies of payable stone, has recently been put on a firm basis by the introduction of capital from outside. In the Heemskirk field there are numerous opportunities for both lode and alluvial mining.

The large undeveloped tin ore properties of North Dundas have been prospected of late less intermittently than has been the case in recent years, but it is rather difficult to forecast their value until work upon them, and on an adequate scale, has proceeded further.

For the tin contained in some of the ore raised on the Zeehan field (at the Oonah and Queen Mines), little or nothing is received, the silver and copper alone being paid for. It thus happens that some of this ore only commands in the local market less than half the gross value of the metal contents. Metallurgists in Europe might with advantage devote some attention to these complex ores, especially now, while the prices of metals are so favourable.

The tin-bismuth-wolfram lodes of the Shepherd and Murphy property have not been worked this year, but there can be no question that they afford an opening for metallurgical skill. An attempt is being made to raise capital in London for their development.

A little tin-mining has been going on at Cox's Bight, near Port Davey, of importance only as indicating a line in the western country along which search might be made for this metal. Tourmaline, the well-known companion of tin ore, has been found (by Mr. T. B. Moore) on spurs between Port Davey and Macquarie Harbour, and it may be that discoveries are in store for us when this *terra incognita* comes to be opened up.

IRON.

The Penguin mines have raised 6840 tons of red hematite of exceptional purity, which was shipped to smelting works in New South Wales for fluxing purposes. The large deposit at the Blythe is still unworked, and the intentions of the owners respecting it are not known. It is believed that a decision is on the eve of being made.

The deposits of iron ore near Beaconsfield are also still neglected. Most of this ore is contaminated with chrome, which renders it unsuitable, except for special purposes, but for those purposes it makes a good metal. The time would seem to have arrived when further experiments with these ores could very well be initiated. Once iron manufacture is established in the State or Commonwealth, more than one of the extensive deposits of iron ore in Tasmania will be turned to profitable account.

COAL.

The quantity raised in 1904 was 61,109 tons, against 49,069 tons in 1903. This is the largest output that has ever been recorded in Tasmania, and there are signs of a further increase in the present year. During the past year two new collieries have been added to the list, viz., the Sandfly and the Catamaran; and since the beginning of this year, the Brightburn Coal Mine at Railton has commenced operations. Prospecting work is proceeding at the Preolenna Mine, and a 12-feet seam of coal is now being tested at Mt. Rex. Some seams on the Denison River have also been brought under the notice of the public.

A dispassionate review of the coal trade suggests that the local supplies are sufficient to meet the demand which exists for such qualities of coal as are offering, but that an increased market is available for any coal which will show an advantage, however slight, over the existing brands. The different seams already worked yield coal of various qualities, and there are grounds for believing in the possibility of discovering in more than one part of the island varieties still more advantageous from a consumer's point of view. Moreover, in course of time, as population increases, some of the more remote places in which good coal is already known to exist will become more easily accessible, and it will be possible to utilise much that cannot now be touched.

POTTERY CLAY.

The announcement that delegates from the Staffordshire Potteries were about to visit Australia, for the purpose of seeing whether that industry could not be started somewhere in the Commonwealth, led the Department to institute enquiries as to whether clays suitable for fine ware did not exist in sufficient quantities for the purpose. The Geologist visited St. Helens, where there are valuable deposits of granitic clay, and collected a good deal of information, with samples, from various quarters, but the announced visit of the delegates has not yet taken place.

The following return shows the quantity and value of mineral products for the State of Tasmania during the year ending 31st December, 1904:—

Mineral.	Quantity.	Value.
		£
Gold	65,921 ozs. (fine)	280,015
Copper (native)	212 tons	14,416
Copper Ore	104 „	1640
Copper (Blister)	8371 „	582,540*
Silver-Lead Ore	51,138 „	203,702
Tin (exported)	2071½ „	255,228
Tin Ore (exported)	245 „	10,893
Wolfram	15½ „	1147
Zinc Ore	1931 „	1982
Flux Ore	9669 „	4697
Coal	61,109 „	51,942
Iron Ore	6840 „	2975
Bismuth	6 cwts.	15
Total Value	...	£1,411,192

* Value of gold contents deducted.

The amount paid in dividends was £281,126 18s. 10d.

GEOLOGICAL BRANCH.

During the year the Government Geologist has prepared reports upon the clay deposits at George's Bay and elsewhere, the goldfields of Mount Victoria and South Mount Victoria, the coal near George Town, and the slate near Badger Head.

The Assistant Geologist prepared reports upon the Stanley River tinfield, the Zeehan silver-lead mining field, and the Mount Farrell Mining District.

The quarterly progress reports of the mineral industry have been issued, as usual. For these, as well as for the special district reports, there is a considerable demand from abroad, and from visitors arriving in the State. Our publications lying upon the tables of public libraries and institutes throughout the world may be regarded as of distinct service in directing the attention of investors to the mineral resources of Tasmania.

INSPECTION OF MINES.

The three Inspectors have satisfactorily discharged their duties in the districts severally allotted to them.

MINING MANAGERS' EXAMINATION.

The annual examination of candidates for mining managers' certificates was held in March. Two candidates only presented themselves for examination. One candidate succeeded in obtaining sufficient marks to entitle him to receive a second-class certificate, but the other failed in his examination.

Copies of the papers set at the examination are appended.

DIAMOND-DRILLS.

The diamond-drills were not in operation during the period under review.

MOUNT CAMERON WATER-RACE BOARD.

The report of the Board is appended.

SCHOOLS OF MINES.

There are three schools in the State, outside the Technical Schools in Hobart and Launceston, in which metallurgical and mining instruction is given, viz., at Zeehan, at Queenstown, and at Beaconsfield. The principal one is the Zeehan School of Mines and Metallurgy, affiliated to the University of Tasmania. It possesses a fine building, with the necessary conveniences for lectures and laboratory work. Its mineralogical museum is a useful feature. The studies embrace a course in metal-mining and one in metallurgical chemistry and assaying; the former is specially designed for those who wish to qualify for appointments as mining managers, the latter for assayers or metallurgical chemists. The Government

Board of Examiners for mining managers' certificates recognise the diplomas won by students in this school, by granting certificates to the holders of the school diploma without further examination. During 1904 there were 17 classes in operation, and there was an average attendance of 58 students. Several students left the district during the year. Three of these hold the diploma of the school, and are occupying remunerative positions in Western Australia; others, holding certificates in various subjects of the course, are filling responsible positions in other States. This school is doing quietly and unostentatiously good and useful work.

DEPARTMENTAL STAFF.

Mr. C. H. Curtain, Inspector of Mines, stationed at Queenstown, who was retired in 1903, was re-appointed to the same office in July, 1904, *vice* Mr. Geo. A. Waller (also Assistant Government Geologist), who retired in April, to take up a position in Queensland.

The other changes made during the year were the removal of Mr. W. A. B. Birchall, Registrar of Mines, from Queenstown to the Law Department, Hobart; Mr. T. E. Rule, Registrar of Mines, Strahan, removed to Queenstown; and Mr. Geo. K. Simmons, removed from the Hobart Office to the Office of Taxes, Launceston.

Mr. H. L. Thomas, Registrar of Mines, Scottsdale, died in November, 1904, and the office has been discontinued.

REVENUE.

The revenue for the year amounted to £16,631 8s. 2d. This amount does not include a sum of £2854 1s. 5d. deposited as survey fees with applications for leases.

CONCLUSION.

The outlook for the present year is a favourable one. The registered value of minerals raised during the first quarter of 1905 exceeds that for the corresponding quarter of 1904 by £32,000. Mining is very active all over the State on thoroughly legitimate lines, and the condition of the industry generally may, in the strictest sense of the word, be described as sound.

In conclusion, I desire to thank the officers of the Departmental Staff for the loyal and efficient manner in which they performed the duties allotted to them, especially during the several months I was compelled to absent myself from office, owing to ill-health.

I have the honour to be,
Sir,
Your most obedient Servant,
W. H. WALLACE, *Secretary for Mines.*

The Hon. C. Lennox Stewart, *Minister of Mines.*

DIAMOND-DRILLS.

Statement of Work done to 30th June, 1904.

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance Bored.	Average cost per foot, inclusive of Labour and Fuel.		
	No. 1 Drill.			feet.	£	s.	d.
1882-3	Back Creek—For Gold	Vertical	7	1330	0	10	9
1883	Lefroy—For Gold	Ditto	4	1011	0	5	3
1884	Tarleton—For Coal	Ditto	1	401	0	5	6
1886	Longford - For Coal	Ditto	2	1585	0	4	0½
1886-7	Harefield Estate—For Coal	Ditto	1	725	0	6	5
1887	Cardiff Claim, Mount Malcolm—For Coal	Ditto	1	562	0	17	11¾
1888	Killymoon Estate—For Coal	Ditto	1	504	0	4	7¾
1888-9	Seymour - For Coal	Ditto	5	2266	0	7	8½
1889 1890	Beaconsfield (Phœnix G.M. Co.) - For Gold	Ditto	1	781	2	0	2
1890	Beaconsfield (East Tasmania G.M. Co.)—For Gold	Ditto	1	978	0	14	9½
1891	Spring Bay—For Coal	Ditto	4	937	0	6	10
1891	Ravensdale—For Coal	Ditto	1	114	0	11	1½
1891-2	Back River, Prosser's Plains—For Coal	Ditto	2	854	0	6	1¾
1892-3	Lefroy (Deep Lead Syndicate)—For Gold	Ditto	4	979	0	15	9
1893	Lefroy (East Pinafore Co.)—For Gold	Ditto	1	317	0	10	3
1895-6	Sandfly—For Coal	Ditto	4	2130	0	11	5
1898 1900	Blue Tier (Anchor Co.)—For Tin	Ditto	9	876½	0	9	1¾
1901-2	Llandaff—For Coal	Ditto	3	1944	0	7	4
1902	Recherche (Catamaran Co.)—For Coal	Ditto	2	956	0	9	3
1903	Ditto (Moss Glen Co.)—For Coal	Ditto	2	667	0	7	6
	Total	...	54	19,917½			

	No. 2 Drill.				
1882	Beaconsfield—For Gold	Horizontal, underground	1	68	No record.
1883	Mangana—For Gold	Ditto	1	546	0 15 1
1884	Guy Fawkes Gully, near Hobart For Coal	Vertical	1	612	0 5 6
1885	Malahide Estate, near Fingal—For Gold	Ditto	5	1897	0 5 6
1886	Carr Villa, near Launceston For Coal	Ditto	1	571	0 5 4
1886-7	Waratah (Mount Bischoff Alluvial T.M. Co.) For Tin	Ditto	7	1548	0 6 1½
1887	Waratah (Mount Bischoff T.M. Co.)—For Tin	Ditto	7	841	0 11 8
1887	Ditto	Horizontal, underground	1	53	0 7 8
1888	Old Beach—For Coal	Vertical	1	593	Abt. 0 10 9
1888	Campania—For Coal	Ditto	1	600	0 7 7½
1888	Richmond—For Coal	Ditto	1	500	0 5 1¾
1889	Back Creek—For Gold	Ditto	4	787	0 8 5½
1891	Macquarie Plains—For Coal	Ditto	2	989	0 4 5½
1891	Jerusalem—For Coal	Ditto	1	344	0 4 9½
1892	Langloh Park—For Coal	Ditto	4	1249	0 5 3¼
1893	Southport—For Coal	Ditto	1	612	0 5 3
1894	Zeehan (Tasmania Crown S.M. Co.)—For Silver	Horizontal, underground	2	319	1 0 2½
1902	Eden—For Coal	Vertical	2	566	1 0 7½
1902-3	Farm Cove—For Coal	Ditto	1	571	0 5 6
	Total	...	44	12,766	

Aggregate number of bores	98
Total Distance bored	32,683½ feet.

W. H. WALLACE, *Secretary for Mines.*

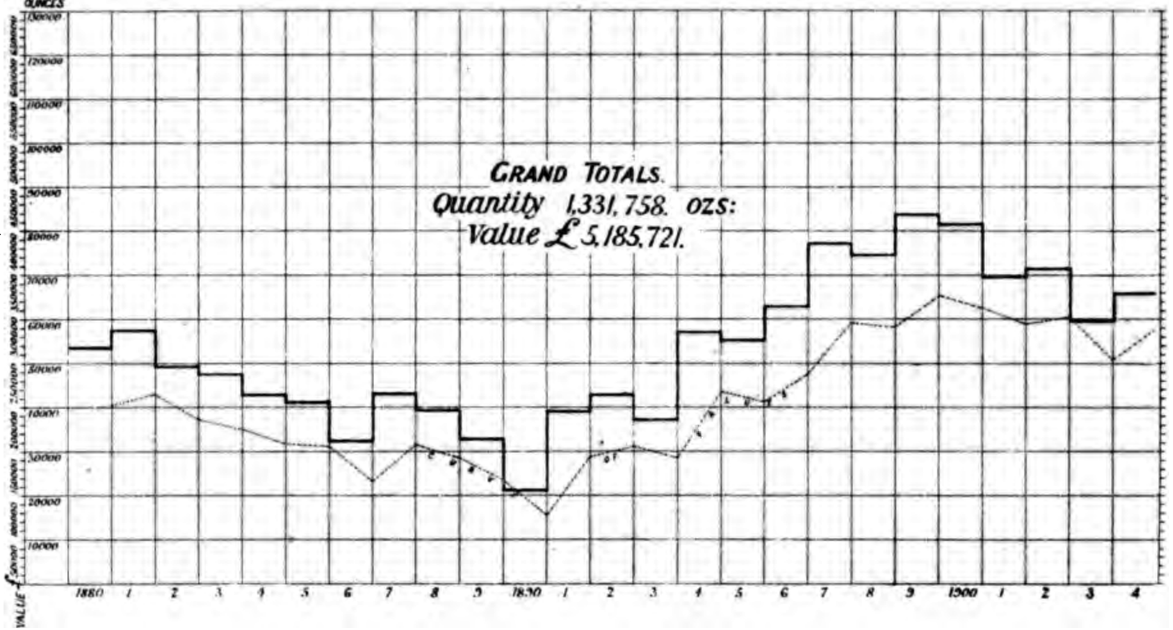
No. 1.

RETURN showing the Quantity and Value of Gold won during the Years **1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, *and* 1904.**

Year.	Quantity.		Value.
	ozs.	dwts.	£
1880	52,595	0	201,297
1881	56,693	0	216,901
1882	49,122	6	187,337
1883	46,577	10	176,442
1884	42,339	19	160,404
1885	41,240	19	155,309
1886	31,014	10	117,250
1887	42,609	3	158,533
1888	39,610	19	147,154
1889	32,332	13	119,703
1890	20,510	0	75,888
1891	38,789	0	145,459
1892	42,378	0	158,917
1893	37,687	0	141,326
1894	57,873	0	217,024
1895	54,964	0	206,115
1896	62,591	0	237,574
1897	77,131	0	296,660
1898	74,233	0	291,496
1899	83,992	0	327,545
1900	81,175	0	316,220
1901	*69,491	0	295,176
1902	*70,996	0	301,573
1903	*59,891	0	254,403
1904	*65,921	0	280,015
	1,331,757	19	5,185,721

* Fine Gold.

Diagram showing Total Quantity & Value of Gold won in Tasmania during the years 1880-1904



JOHN VAIL, GOVERNMENT PRINTER, TASMANIA.

No. 2.

***RETURN** showing the Quantity and Value of Gold obtained from Quartz during the Years* 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 902, 1903, *and* 1904.

Year.	Quantity.	Value.
	ounces.	£
1880	34,345	130.622
1881	45,776	174.956
1882	36,215	137,183
1883	36,672	138,060
1884	30,540	114,630
1885	33,266	124.234
1886	25,004	87,516
1887	33,427	123,453
1888	34,156	126,139
1889	33,069	116,517
1890	17,829	64,184
1891	33,659	126,221
1892	34,386	128,947
1893	30,163	113,111
1894	52,239	195,896
1895	51,628	193,605
1896	59,453	222,948
1897	74,937	288,432
1898	72,080	283,422
1899	81,751	319,141
1900	79,977	311,580
1901	*68,779	292,155
1902	*70,440	299,212
1903	*58,868	250,054
1904	*65,159	276,779
	1,293,818	4,638,997

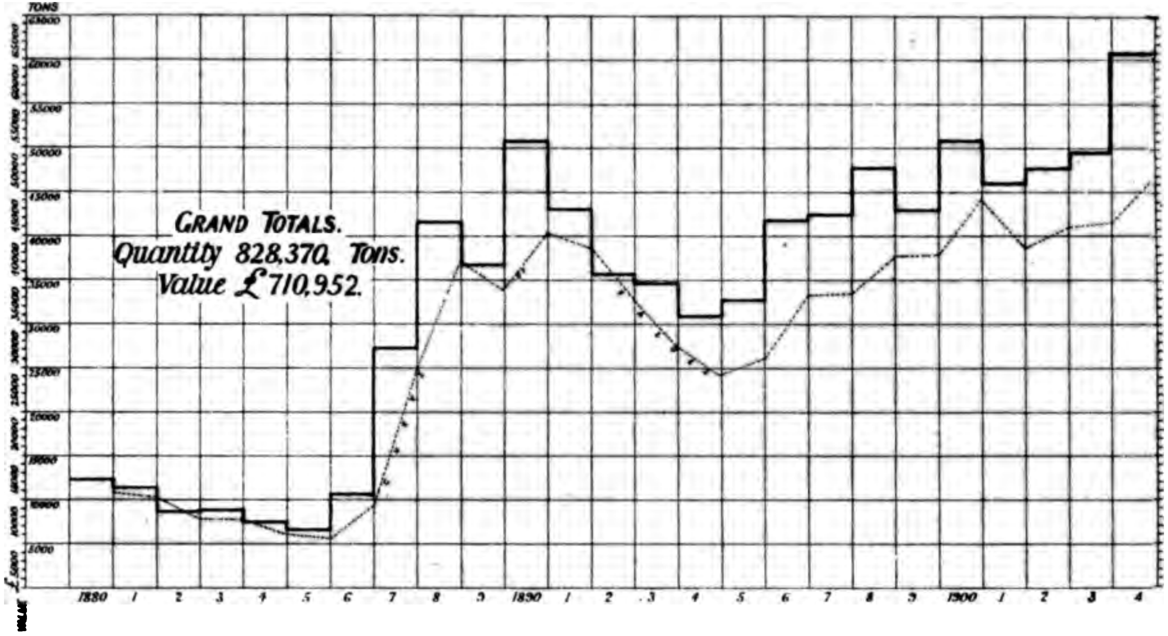
* Fine Gold.

No. 3.

RETURN** showing the Quantity and Value of Coal raised during the Years* **1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903,** ***and **1904.**

Year.	Quantity.	Value.
	Tons.	£
1880	12,219	10,998
1881	11,163	10,047
1882	8803	7923
1883	8872	7985
1884	7194	6475
1885	6654	5989
1886	10,391	9352
1887	27,633	24,870
1888	41,577	37,420
1889	36,700	33,030
1890	50,519	45,467
1891	43,256	38,930
1892	36,008	32,407
1893	34,693	27,754
1894	30,499	24,399
1895	32,698	26,159
1896	41,904	33,523
1897	42,196	33,757
1898	47,678	38,256
1899	42,609	38,349
1900	50,633	44,227
1901	45,438	38,451
1902	48,863½	41,533
1903	49,069	41,709
1904	61,109	51,942
	828,370½	710,952

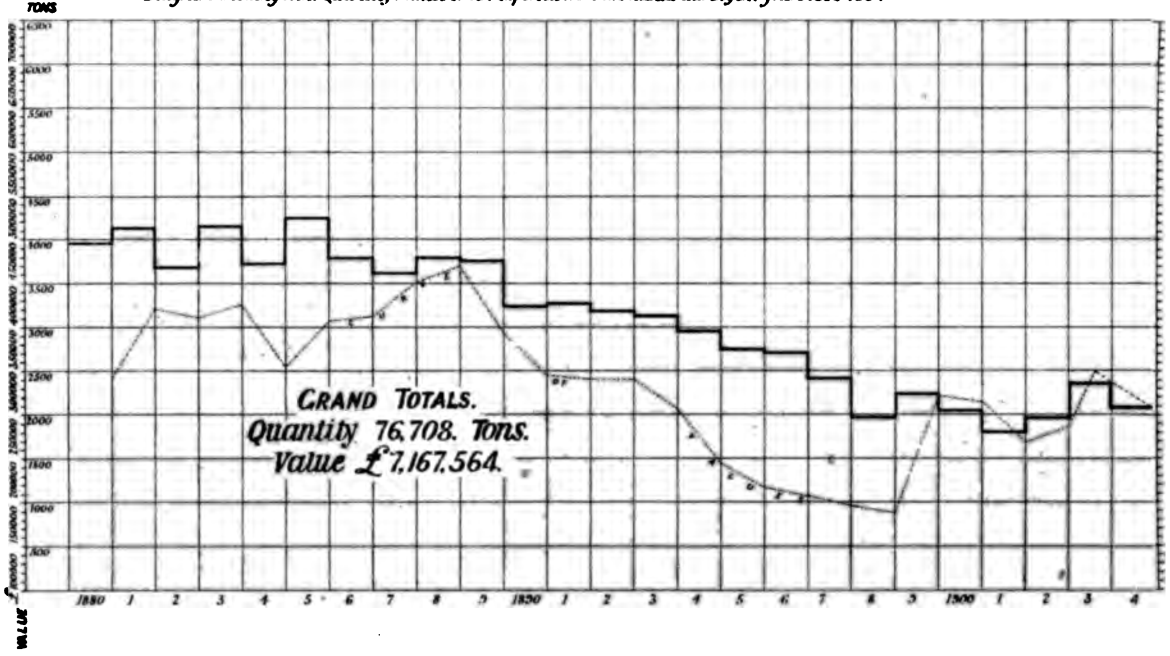
Diagram showing Total Quantity & Value of Coal mined in Tasmania during the years 1880-1904



GRAND TOTALS.
Quantity 828,370. Tons.
Value £710,952.

JOHN VAIL, GOVERNMENT PRINTER, TASMANIA.

Diagram showing Total Quantity & Value of Tin exported from Tasmania during the years 1880-1904



GRAND TOTALS.
Quantity 76,708. Tons.
Value £7,167,564.

John Vail, Government Printer, Tasmania.

No. 4.

***RETURN** showing the Quantity and Value of Tin exported from Tasmania during the Years* **1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903,** *and* **1904**, *compiled from Customs Returns only.*

Year.	Quantity.	Value.
	Tons.	£
1880	3954	341,736
1881	4124	375,775
1882	3670	361 046
1883	4122	376,446
1884	3707	301,423
1885	4242	357,587
1886	3776	363,364
1887	3607½	409,853
1888	3775¼	426.321
1889	3764	344,941
1890	3209¼	296,368
1891	3235	291,715
1892	3174	290,083
1893	3128½	260,219
1894	2934	198.298
1895	2726¾	167,461
1896	2700	159,036
1897	2423½	149,994
1898	1972	142.046
1899	2239¼	278.323
1900	2029	269,833
1901	1789½	212,542
1902	1958¼	237,828
1903	$2376\frac{3}{10}$	300,098
1904	2171½	255,228
	$76{,}708\frac{9}{20}$	7,167,564

No. 5.

RETURN** showing the Quantity and Value of Silver Ore produced during the Years* **1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903,** ***and **1904.**

Year.	Quantity.	Value.
	Tons.	£
1888	417	5838
1889	415	7044
1890	2053	26,487
1891	4810	52,284
1892	9326	45,502
1893	14,302	198,610
1894	21,064	293,043
1895	17,980	175,957
1896	21,167	229,660
1897	18,364	200,167
1898	15,320	188,892
1899	31,519½	250,331
1900	26,564	279,372
1901	28,774	207,228
1902	46,480	218,864
1903	42.422	192,492
1904	51,138	203,702
	352,115½	2,775,473

No. 6.

RETURN showing the Quantity and Value of Blister Copper produced during the Years 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, *and* 1904.

Year.	Quantity.	Value.
	Tons.	£
1896	41½	1245
1897	4700	322,500
1898	4955½	400,668
1899	8598	735,305
1900	9449	907,288
1901	9981	879,625
1902	7745	*462,151
1903	6684	*478,023
1904	8371	582,540
	60,525	4,769,345

* Value of Gold contained deducted.

No. 7.

RETURN showing Quantity and Value of Copper Matte exported during the Years 1902, 1903, *and* 1904.

Year.	Quantity.	Value.
	Tons.	£
1902	2500	50,112
1903	3727	83,624
1904	—	—
	6227	133,736

No. 8.

RETURN showing the Quantity and Value of Copper Ore produced during the Years 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, *and* 1904.

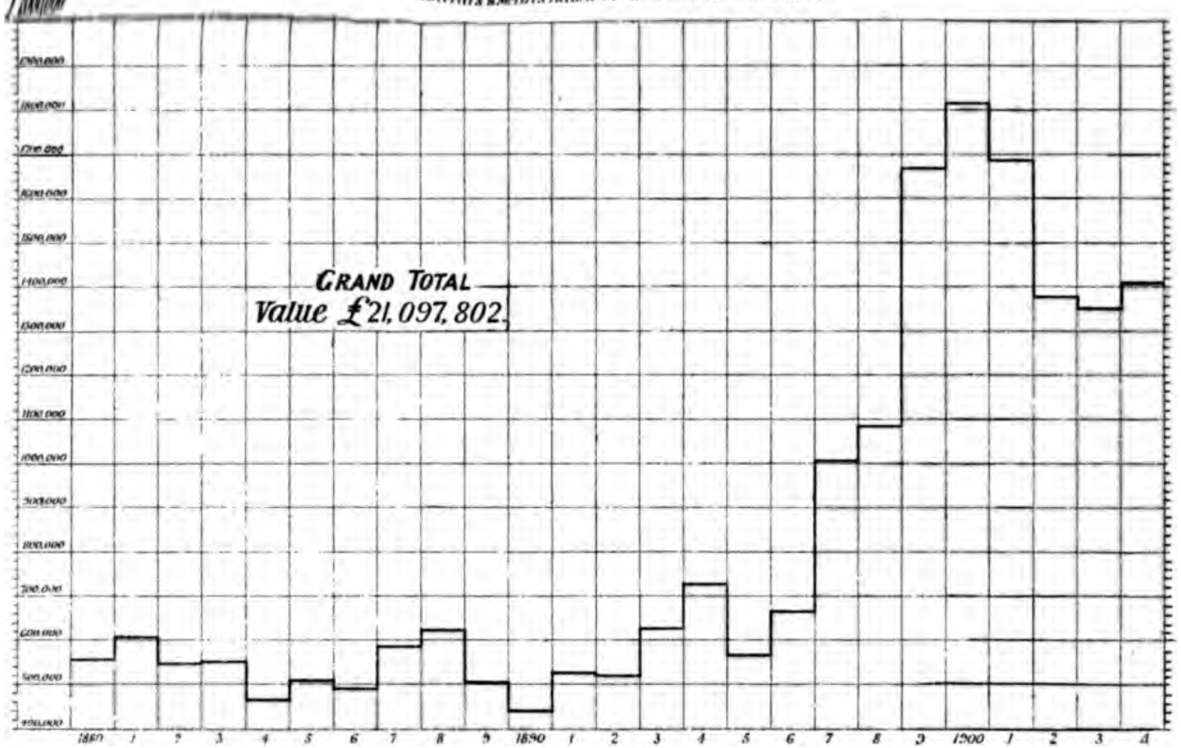
Year.	Quantity.	Value.
	Tons.	£
1896	34	1020
1897	75	2250
1898	394	8128
1899	1695	26,833
1900	4221½	63,589
1901	11,221	130,412
1902	5994	65,270
1903	102	790
1904	104	1640
	23,840½	299,932

No. 9.

RETURN showing the Quantity and Value of Iron Ore produced during the Years 1897, 1898, 1899, 1900, 1901, 1902, 1903, *and* 1904.

Year.	Quantity.	Value.
	Tons.	£
1897	894	812
1898	1598	1598
1899	3577	3474
1900	5375	5995
1901	612	417
1902	2386	1075
1903	5980	2905
1904	6840	2975
	27,282	19,251

...of Minerals & Metals raised in Tasmania from 1880-1904



John Vail, Government Printer, Tasmania.

No. 10.

***RETURN** showing the Quantity and Value of Asbestos produced during the Years* 1899, 1900, 1901, 1902, 1903, *and* 1904.

Year.	Quantity.	Value.
	Tons.	£
1899	200	363
1900	128	113
1901	46½	45
1902	—	—
1903	—	—
1904	—	—
	374½	521

No. 11.

***RETURN** showing the Quantity and Value of Wolfram produced during the Years* 1899, 1900, 1901, 1902, 1903, *and* 1904.

Year.	Quantity.	Value.
	Tons.	£
1899	3½	99
1900	53¾	2058
1901	—	—
1902	—	—
1903	—	—
1904	15½	1147
	72¾	3304

No. 12.

***RETURN** showing the Quantity of Silver Lead and Copper Ore smelted for period 25th June to 31st December, 1896, and 1st January 1897, to 31st December, 1904.*

Year.	Ore Smelted.	Products.			Yield.			
		Silver Lead Bull'n.	Blister Copper.	Matte.	Copper.	Silver.	Gold.	Lead.
	Tons.	Tons.	Tons.	Tons.	Tons.	Ozs.	Ozs.	Tons.
1896	26,028$\frac{13}{20}$	—	—	2417$\frac{6}{20}$	1235$\frac{1}{20}$	75,951	4707	—
1897	90,773$\frac{1}{2}$	—	3476$\frac{13}{20}$	257$\frac{16}{20}$	3583$\frac{14}{20}$	334,349	16,485	—
1898	170,933	—	4992	—	4783	606,123	24,418	—
1899	275,239	2295	8463	89$\frac{8}{20}$	8362	1,089,657	27,615	—
1900	363,113	4817	9449	—	9341	1,215,036	26,255	—
1901	355,528	1839	9982	50	9880	800,317	21,717	—
1902	411,736	6825	7727	2882	8841	1,674,816	24,719	6654
1903	399,032	7560	6683	3413	8094	1,855,158	25,238	7529
1904	433,366	—	8371	—	8265	1,896,134	26,809	7754

No. 13.

***RETURN** showing the Average Number of Persons engaged in Mining during the Years 1880 to 1904 inclusive.*

Year.	Number.	Year.	Number.
1880.....................	1653	1893.....................	3403
1881.....................	3156	1894.....................	3433
1882.....................	4098	1895.....................	4062
1883.....................	3818	1896.....................	4350
1884.....................	2972	1897.....................	4510
1885.....................	2783	1898.....................	6052
1886.....................	2681	1899.....................	6622
1887.....................	3961	1900.....................	7023
1888.....................	2989	1901.....................	6923
1889.....................	3141	1902.....................	5934
1890.....................	2868	1903.....................	6017
1891.....................	3219	1904.....................	6194
1892.....................	3295		

No. 14.

***RETURN** showing the Number and Area of Leases held under "The Mining Act,* 1900," *in force on 30th June in years* 1898 *to* 1903 *inclusive, and on 31st December,* 1903, *and 31st December,* 1904.

Nature of Lease	In force on 30th June. 1898.		In force on 30th June. 1899.		In force on 30th June, 1900.		In force on 30th June, 1901.		In force on 30th June, 1902.		In force on 30th June, 1903.		In force on 31st December, 1903.		In force on 31st December. 1904.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.
For Minerals, Silver, Tin, &c.	1290	66,981	1207	64,339	1487	70,500	1388	60,865	1063	45,399	950	40,068	826	33,325	868	33,824
For Coal, Slate, Shale, &c.	41	5943	39	6002	52	7258	55	7566	52	7819	66	10,767	54	9119	47	7546
For Gold	702	7190	652	6725	647	6623	566	6091	425	4166	310	3117	243	2505	222	2268
Dredging Claims	—	—	—	—	—	—	—	—	—	—	—	—	15	124	29	469
Mining Easements	—	—	—	—	—	—	—	—	—	—	—	—	34	225	39	234
Water Rights Mineral and Gold	159	784 sluice-heads.	200	933 sluice-heads.	225	1004 sluice-heads.	267	1318 sluice-heads.	300	1691 sluice-heads.	299	1514 sluice-heads.	281	1460 sluice-heads.	346	1495 sluice-heads.

No. 15.

COMPARATIVE Statement of Revenue from Mines, being Rents, Fees, &c. (exclusive of Survey, Fees), paid to the Treasury for the Years ending 30th June, from 1880 to 1903, and for Six months ending 31st December, 1903, and for the Year ending 31st December, 1904.

Year.	Amount.			Year.	Amount.		
	£	s.	d.		£	s.	d.
1880	8944	5	11	1893	16,971	9	2
1881	20,936	5	5	1894	16,732	7	7
1882	23,077	1	9	1895	15,323	1	9
1883	15,439	14	5	1896	20,901	13	2
1884	6981	11	10	1897	25,631	0	3
1885	11,070	5	7	1898	33,061	13	9
1886	12,523	10	4	1899	24,696	10	5
1887	14,611	11	5	1900	28,380	11	10
1888	23,502	8	4	1901	21,569	5	2
1889	17,254	9	0	1902	19,471	0	1
1890	26,955	4	9	1903	17,776	14	3
1891	37,829	16	5	1903, 1 July to 31 Dec.	14,758	17	1
1892	17,568	18	4	1904, Jan. to. Dec.	16,631	8	2

The above Statement does not include Stamp Duties upon Transfer of Leases and Registration of Companies, or the Tax payable upon Dividends, from which sources large sums are derived.

No. 16.

RETURN showing the Total Number and Area of Leases in force on 31st December, 1904.

Minerals.	Number.	Area.
		Acres.
Gold	222	2268
Minerals	118	7134
Silver	164	8392
Copper	34	1822
Tin	528	15,430
Coal	34	5503
Limestone	5	386
Iron	12	534
Slate	1	200
Wolfram	1	20
Asbestos	4	232
Precious Stones	1	80
Lithographic Stone	1	97
Marble	1	317
Shale	4	1040
Phosphate of Lime	1	3
Nickel	6	180
Machinery Sites	21	75
Dredging Claims	29	469
Mining Easements	39	234
Water Rights	346	1495 sluice-heads, & 729 acres dams

No. 17.

RETURN showing the Average Number of Miners employed during the Year ending 31*st December*, 1904.

	Europeans.	Chinese.
Northern and Southern Division	786	...
North-Eastern Division	510	130
Eastern Division	786	64
North-Western Division	394	...
Western Division	3524	...
	6000	194

No. 18.

RETURN showing the Mining Companies registered during the Year ending 31*st December*, 1904.

Number of Companies.	Capital.
16	£18,200

In addition to the above, 11 Agents for Foreign Companies, and 8 Syndicates, under 60 Vict. No. 51, were registered.

No. 19.

***RETURN** showing the Total Area of Land applied for during the Year ending* 31*st December*, 1904.

Mineral.	No. of Applications.	Area.
		Acres.
Asbestos	3	162
Antimony	1	40
Coal	10	1960
Copper	17	795
Galena	2	158
Gold	58	577
Iron	1	5
Minerals	46	2608
Nickel	5	197
Silver	9	540
Tin	185	5702
Wolfram	11	527
Machinery Sites	3	5
Dredging Claims	56	1511
TOTAL	407	14,787

In addition to the above, 19 applications for Mining Easements, and 86 applications for Water Rights (300 Sluice-heads and 69 acres Dam and Dump Sites) were received.

No. 20.

RETURN showing the total Amount of Rents, Fees, &c., received by the Mines Department during the Year ending 31*st December*, 1904.

Head of Revenue.	Amount.		
	£	*s.*	*d.*
Rent under "The Mining Act, 1900," for Gold and Minerals	15,436	12	11
Fees, ditto ditto	1194	15	3
Survey Fees	2854	1	5
Rent of Diamond-drills	—		
TOTAL	19,485	9	7

No. 21.

RETURN showing the Amounts paid in dividends by Mining Companies during the Year ending 31*st December*, 1904.

Mines.	Dividends.		
	£	*s.*	*d.*
Copper	150,000	0	0
Gold	21,774	14	6
Tin	76,735	0	0
Silver	32,617	4	4
TOTAL	£281,126	18	10

REPORT OF THE MOUNT CAMERON WATER-RACE BOARD FOR THE YEAR ENDING 31ST DECEMBER, 1904.

3rd March, 1905.

SIR,

WE have the honour to present the report of the Board for the year ending 31st December, 1904.

Water.—The quantity of water at present available is 18 sluice-heads only, which is always over applied for. The carrying capacity of the race is 50 sluice-heads, which quantity, if available, could be readily disposed of. Applications for water have considerably increased lately, but owing to the limited supply available, the present consumers have had to submit to a reduction, and the Manager has had to refuse several applications from new customers.

Flumings.—There are 24 flumings on the race, of an aggregate length of 1969½ yards, the longest being 352 yards and the shortest only 14 yards. They are in such an advanced state of decay that many of them are beyond repair, and cannot possibly last through the winter. It is only owing to the constant care and attention bestowed upon them that they have been maintained so long. Those requiring immediate attention are Nos. 1, 2, 8, and 9, and should be replaced by cuttings and embankments, the estimated cost of which is £414 6s. 3d. The scarcity of water and the consequent exposure of the boards to the present dry weather is causing them, in places, to crumble away, and during the winter months when the water-supply increases the additional weight may be expected to cause a total collapse of one or more of these flumings, through the rotten condition of the trestles and boards. The Board again strongly recommends having the works above referred to carried out without further delay.

Syphons.—The number of bands which had to be made and placed around the breaks which occurred in the syphon-pipes was 242, the cost of repairs being £90 13s. 5d. It is owing to the constant and increasing attention of the Manager and channel-keepers that the pipes have been maintained so long, and the time is fast approaching when the renewal of these pipes will have to be undertaken.

On account of the recent revival in the tin-mining industry of the Gladstone District, and the large area of ground which has been taken up and is being prospected with very encouraging results, the Board feels warranted in again drawing the attention of the Government to its report for the year ending 30th June, 1903, and asking that favourable consideration may be given to the recommendations therein contained. Feeling the urgency of the renewals referred to in that report, the Board, during the past year, applied to the Government for an advance, on loan, of the sum of £500, which may be considered as a first instalment of the £3000 required for the purpose of replacing all the flumings by permanent earth and stone work.

The statistics for the year are as follows:—

Average per week of claims supplied, 9.

Greatest number supplied in any one week, 12.

Total number of heads supplied:—

Under fixed or cash scale	5009½
Under royalty or credit scale...	136½
TOTAL	5146

Tin ore raised, 1 ton 10 cwts. 2 qrs. 19 lbs., royalty scale; 117 tons 4 cwts. 3 qrs. 9 lbs., fixed scale; total, 118 tons 15 cwts. 2 qrs.

Average number of miners employed:—Europeans, 30; Chinese, 6; total, 36.

Total receipts for the year:—Fixed scale, £2442 17s. 1d.; royalty scale, £30 11s. 6d.; total, £2473 8s. 7d.

Expenditure: Cost of maintenance and management:—

	£	s.	d.
Salary and wages	675	19	10
Repairs to syphon-pipes	90	13	5
Repairs to flumings	8	6	0
Travelling expenses	37	17	0
Stores and tools...	6	6	7
Insurance...	3	6	0
TOTAL	£822	8	10

Paid to Public Debts Sinking Fund, 1904 (including moiety of rents of mineral land served by the race), £646 2s. 8d., being the profits made for the half-year ending 30th June, 1904.

Total amount paid to Public Debts Sinking Fund to 30th June, 1904, £8890 11s. 11d.

Total cost of purchase and construction, £34,281 19s. 0d.

W. H. WALLACE, *Chairman of the Board.*

EDWARD L. HALL,
W. H. TWELVETREES,
S. HAWKES,
JOHN SIMPSON, } *Members of the Board.*

The Hon. the Minister of Mines, Hobart.

MINE MANAGERS' EXAMINATION.

22nd March, 1904.

Questions set.

Subject A.—Mining.

1. A reef 3 feet wide is being stoped between two levels 80 feet apart vertically. It is required to sink a shaft (which is 12 feet long by 4 feet wide, and divided into three compartments), and make provision for cutting the reef by means of crosscuts at two deeper levels each 80 feet apart, without hindrance to other work. The mine is equipped with suitable winding gear and baling tanks, 200 gallons capacity; also air compressor, air winch, and rock drills. Country, hard slate. Water at bottom level 1000 gallons per hour, and at bottom of shaft (20 feet below plat) 50 gallons per hour. Explain by description and diagrams the methods you would adopt, having due regard to safety of men engaged, ventilation, disposal of mullock and water, and economy in working.
2. How would you re-timber a drive the original timbers of which are much shattered by downward and lateral pressure, with a swelling bottom? Give rough sketch of timbers you would use. The original sets were placed 4 feet between centres, and lined at back and sides with 5-feet laths.
3. In a winze connecting two levels 60 feet apart the payable ore (12 inches wide) was found to extend downwards from top level to a depth of 40 feet, the rest being blank. Show by diagram two methods of working the payable ore out—"underhand and overhand stoping." Assume that the payable ore continued for 100 feet from end of winze, and that both levels were driven beyond that point. State which method you would adopt, and why.
4. In overhand stoping, how would you take out the last stope immediately under a main drive, at the bottom of which the reef was the full width of the drive. Illustrate your answer by sketches.
5. Name some of the advantages and disadvantages of rock drills when compared with hand labour—under what conditions you would recommend their use—and give a diagram of holes you would bore in face of a main drive 6′ × 5′.
6. What style of timbering would you adopt when driving—
    1. Through ground with greasy heads.
    2. Through running ground with a little water.

   Illustrate your answer with sketches.
7. Explain, with sketches, the construction and action of any form of machine drill.
8. What are the different explosives used in mining? Give their composition, uses, and relative merits.

9. A lode 10 ft. wide runs lengthwise through a property for a distance of 2000 feet, and underlays at an angle of 45°. State
   (*a*) What kind of a shaft, vertical or underlay, and of what size, you consider most suitable for working this proposition.
   (*b*) Where it should be placed.
   (*c*) Position and size of crosscuts.
   Give careful reasons for your statements.
10. Describe in detail the method of constructing a dam to impound water in a crosscut, the country rock being a hard schist.
11. Give dimensioned sketches of a headgear suitable for hauling from a 3-compartment shaft 1000 feet deep, the maximum load being 2 tons.
12. Describe any efficient form of centrifugal ventilator.

SUBJECT B.—ORE-DRESSING AND SAMPLING.

1. Describe and sketch any form of automatic sampler for estimating the value of tailings from a stamp-mill in operation.
2. Explain the construction, principle, and action of the Wilfley or Frue Vanner.
3. Describe and sketch a Harz Jig. Explain how its work can be affected by variations in (*a*) the speed; (*b*) length of stroke; (*c*) nature of material in feed.
4. Describe what you consider the best method of treatment by cyanide of the following, and give strength of solution you would use in each case—
   A. Leachable tailings direct from battery.
   B. Slimes direct from battery.
   C. Old oxidised tailings and slimes, the latter in layers of 6 inches thick and in proportion of 80 per cent. of sand and 20 per cent. slimes, all very acid.
5. Having a sample of 10 lbs. of quartz containing iron pyrites and gold, how would you determine the following, practically?
   1st. Percentage of gold to be saved by battery treatment (box, plate, and ripples).
   2nd. Percentage of concentrates and gold to be recovered by chlorinating same.
   3rd. Percentage of gold to be saved by cyaniding tailings.
   4th. Total estimated extraction.
6. How would you coat copper plates with quicksilver, keep same in good order during a crushing, and remove all the gold and quicksilver when required?

SUBJECT C.—MINING GEOLOGY.

1. Mention how you would identify and distinguish the several minerals of a deposit in which wolfram, iron oxide, zinc blende, and tourmaline are associated with cassiterite.
2. Discuss some of the theories which have been advanced to account for the origin of metalliferous veins.

3. Describe the phenomenon of cleavage as observed in slates, and give an explanation of its cause.
4. Give an account of the different kinds of faults by which lodes are disturbed, and show how you would recover lodes which have been lost in consequence of faulting.
5. What do you understand by the term "schist"? How does schist differ from slate? Name some of the varieties of schistose rocks.
6. Name the essential minerals which form the following rocks:—Granite, Basalt, Serpentine, Diorite.
7. Place the following names of geological systems in proper order, beginning with the most ancient:—Permo-Carboniferous, Silurian, Tertiary, Cambrian, Devonian, Jurassic, Triassic.

SUBJECT D.—MINING SURVEYING.

1. Find the length and bearing of the closing line of the following traverse:—

Line.	Bearing.	Distance.
A to *B*	N. 60° W.	360 feet
B to *C*	N. 41° 38′ E.	173 „
C to *D*	S. 89° 15′ E.	237 „

2. Find the area of the figure *ABCD* in Question No. 1.
3. The figure *ABCD* in Question No. 1 is to be divided into two equal parts by a straight line parallel to *AD*. At what distance from *A* will this line cut *AB* ?
4. Describe fully the adjustments of the Surveyor's transit. Show the effect of an error of
   (*a*) The horizontal axis;
   (*b*) Collimation.
5. Explain in detail the method of setting out a circular curve to connect two straight portions of a tramway.
6. Reduce the following levels, and show how the reduction may be checked:—

Back Sight.	Intermediate.	Fore Sight.	Reduced Level.
10·58			100·00
	9·73		
1·29	...	6·21	
	3·98		
8·38	...	5·77	
	7·52		
		9·01	

7. Describe fully what precautions must be taken in order to secure accuracy in chaining in rough country.
8. Describe the method of connecting the survey of two levels in a mine through a winze—
   (1) Of regular underlay;
   (2) Of irregular underlay.

Subject E.—Surface Work.

1. A Cornish boiler is 26 feet long by 6 feet 6 inches diameter; the flue is 3 feet 6 inches uniform diameter; the shell and flue plates are ⅜ inch thick; end plates $\frac{9}{16}$ inch thick; single riveted throughout, rivets ¾ inch diameter by 2 inches pitch. There are 4 gusset stays each end, and 6 Galloway tubes in the flue. All material steel. Calculate the approximate weight of this boiler.
2. Calculate the safe working pressure for the above boiler.
3. If you required to parbuckle the above boiler down a fairly smooth incline of 1 in 3, what would be the smallest diameter of steel wire rope you would consider it safe to use?
4. What would be the approximate weight of the brick-work required to set the above-mentioned boiler in the usual manner?
5. If you wished to place a safety-valve of the lever and ball type on this boiler, which would be so made that each 1 lb. on the end of the lever would exactly balance each 1 lb. pressure in the boiler, how would the different parts be proportioned relatively to each other? Neglect friction and the weight of the lever and valve.
6. A tin drift consisting of sand is overlaid by partially-decomposed basalt, all of which can be removed by hydraulicking. Assuming a certain amount of overburden and drift removed daily, give dimensioned sketches of fluming suitable for carrying away (*a*) the drift, (*b*) the overburden.
7. Describe and sketch an approved form of hydraulic nozzle or "gun," showing in detail the arrangements for giving vertical and horizontal movement.
8. Give dimensioned sketches of a bridge suitable for carrying a tramway over a ravine 30 feet wide and 60 feet deep. The weight of the locomotive employed on the tramway is 8 tons.
9. Discuss the relative merits of cast iron and wrought iron pipes for carrying water, paying attention to the following points:—Strength, weight, jointing, cost, method of construction.
10. Give a careful specification of a timber dam for impounding water 10 feet high in the centre and 25 feet along the crest. The nature of the surface may be assumed.

Subject F.—Book-keeping and Mine Accounts.

1. The length of a square paddock is 50 yards; what will it cost to asphalt it at 6½d. per square foot?
2. Extract the square root of 106929.
3. What would be the cost per cubic foot of driving a heading 9 feet wide by 8 feet high at the rate of 30s. per lineal yard?

4. If a man earns £5 18s. 6d. plus an increase of 2½d. per cent., what is the total amount due to him?
5. Name, describe, and give illustrations of the accounts and statistical returns which a mining manager might be expected to send periodically (say monthly) to the head office.
6. What entries are made on the Dr. side of a Cash account, and why?
7. What rule do you follow in posting from the Cash Book to the Ledger, and how do you make the entries in the Ledger?

SUBJECT G.—MINING LAW.

1. What is the minimum age at which a boy may be employed in any mine?
2. What is the maximum quantity of gunpowder or other explosives which may be stored in any mine, and what distance should same be stored from any travelling road?
3. What is the maximum quantity which may be taken for use into the workings of a mine, and how should same be carried?
4. What is required to be done to abandoned shafts or excavations near roads to prevent accidents?
5. How are leased claims required to be marked during the term of the lease?
6. What constitutes a "sluice-head" of water under the Mining Regulations?

REPORT OF THE GOVERNMENT GEOLOGIST.

Government Geologist's Office,
Launceston, 31st December, 1904.

SIR,

I HAVE the honour to submit my Report as Government Geologist for the year ending 31st December instant.

During the year I have prepared the following reports:—

1. On deposits of clay at George's Bay and elsewhere, 1st March, 1904.
2. On the South Mount Victoria mining field, 9th May, 1904.
3. On the Volunteer Consolidated Gold Mine, at Mathinna, 14th September, 1904.
4. On the Mount Victoria goldfield, 7th October, 1904.
5. On coal near George Town and slate near Badger Head, 2nd December, 1904.

Besides these, several Departmental reports have been prepared.

Mr. Geo. A. Waller, then Assistant Government Geologist, has submitted reports on—

6. The prospects of the Stanley River tinfield, 25th January, 1904.
7. The Zeehan silver-lead mining field, 10th April, 1904.
8. The Mt. Farrell Mining District, 14th April, 1904.

The reports cover the mineral fields on both sides of the island, and contain, in the aggregate, a fund of information about our mineral resources.

While matters of scientific interest have not been ignored, the chief aim in preparing these reports for publication has been one of a directly economic nature. The object in view has been to furnish useful information and guidance to those who are interested in our mining industry.

Deposits of Pottery Clay.

A visit of delegates from Staffordshire to the States of the Commonwealth, with a view of establishing pottery works, having been announced, I was instructed to inspect and report on certain deposits of kaolinic clay near St. Helens. A thick stratum of felspathic clay outcrops on the eastern side of George's Bay, of a very good quality, and proved to a depth of at least 30 feet for about a quarter of a mile along the bank. It is suitable for the manufacture of high-class pottery. An excellent light-coloured kaolinic clay occurs also about three miles from the Bay, underlying the tin-wash worked at the lower Royal Ruby Mine.

A similar clay appears in the drifts of the Pioneer Mine, between Moorina and Gladstone. A refractory fireclay, 2 to 6 feet thick, overlies the coal at the Dulverton Colliery; and this class of clay occurs at nearly all the coal mines on the Mt. Nicholas Range. At the Sandfly Coal Mine, the No. 3 seam rests upon a bed of white clay, which has been penetrated to a depth of 19 feet. There is also a body of good silicious clay in the Silurian slates on the Den Hill, of a character suitable for terracotta manufacture.

The clays of the Launceston Tertiary basin embrace every variety in quality, from brick-earth to pipeclay, and exist in great quantity. All over the island deposits of workable clay are known to be present, but those most suitable for chinaware and fine pottery are found in the tinfields, being due to the disintegration of the granite.

It may be predicted that, sooner or later, the clays which are in the most favourable positions for markets will be subjected to careful working trials, to which they may be expected to respond satisfactorily, and form the foundation of a stable and profitable industry.

South Mount Victoria.

I visited this field, which is from 8 to 12 miles north of Mathinna, and comprises the area traversed by Dan's Rivulet and its tributaries. The Alberton Track passes through it, and past the various mines. The country consists of slates and sandstones, which are the northerly prolongations of the strata of the Mathinna goldfield. Several mines in the district are idle, some having been abandoned for an indefinite period, others shut down only temporarily. The Havelock Mine, which had a good shoot of stone in shallow levels, will probably start again before long. The Hinemoa was started in April, 1903, and preliminary work was carried on for some time. Attempts are now being made in New Zealand to float it in conjunction with the Una group. The King Edward and Carnegie Mines were working at the time of my visit, but on a small scale. On the Starlight, Strickland, Lady Havelock, Laranda, and O'Brien's Company's sections work was suspended. Work throughout has been confined to shallow depths (maximum 140 feet), and the shoots of stone, though payable for certain distances, have not been followed down. The several mining enterprises appear to have been started with insufficient capital for carrying on exploratory and dead work, and died a natural death when the gold shoots came to an end horizontally, or water was encountered with increasing depth. There is no reason for despairing of this field; its future may be said to depend upon the introduction of capital for the development of the reefs at a depth.

Volunteer Consolidated Mine.

This mine belongs to a group of enterprises at Mathinna which are developing ground parallel with the New Golden Gate ridge, and in which considerable interest is centred. Owing to slides having displaced one of the most promising reefs in the mine, I was directed to examine the geological and underground conditions. My conclusions were that the faults should be driven through and the drive continued. Subsequent work has justified this view, which is satisfactory, as the mine has considerable chances of success, if funds are forthcoming to continue opening up.

Mount Victoria Goldfield.

This important district was examined for a north and south distance of nearly 4 miles. Its slates and sandstones are a continuation of those at South Mt. Victoria, so that one uninterrupted belt of auriferous country continues from Fingal and Mathinna to North Mt. Victoria.

Large numbers of gold-bearing reefs have been found, and upwards of £50,000 worth of gold extracted; but some of the old shoots were worked out, and investors are now rather timid about venturing much.

None of the reefs (with the exception of the Bright Star, where a shaft was sunk 50 feet) have been followed down to ground water-level; and this fact encourages further work, for at shallow depths, and at the outcrops, the makes of stone, though often short, have in numerous instances proved to be rich in gold. The Long Struggle, New Mercury, and McCaul's were the only ones at work and producing gold at the time of my visit.

The Reform and Mammoth were endeavouring to obtain capital for development. This part of our eastern gold belt will in all probability become the seat of a great gold-mining industry once investors can be induced to face the preliminary outlay and risks of development.

Coal near George Town.

I visited the Reward section at Musk Vale, where some coal was found in 1888. A few shallow shafts have shown an irregular seam, about a foot thick, in soft sandstone, and resting upon a dark tenacious clay. Both sandstone and clay belong to the series of Tertiary deposits very abundant along the Tamar. The coal is a rather superior brown coal, intermediate in character between lignite and true coal. The seam, where struck, is not of a workable thickness. A good deal of work has been done on the banks of the Tamar at different places between Launceston and the mouth of the river, where indications of coal were thought to exist, but in every instance in the ligneous clay beds of Tertiary age. The opinion is freely expressed that if work is pushed on, and more cover obtained, the quality of the coal will improve; but this is a false lure. As long as work is confined to the Tertiary sands and clays, only brown coal or lignite can be looked for. The Jurassic or Permo-Carboniferous Coal Measures may exist at a greater depth; but this is speculative, and can only be settled by boring through the Tertiary into the underlying strata.

Stanley River Tinfield.

Mr. Waller has reported on this area, within which tin has been traced north and south for 5 miles, occurring both as heavy alluvial and in the form of large lodes. Rich boulders of tin-stone are found in great quantity in the alluvial, which is taken as pointing to the presence of strong shoots of ore in the quartz-tourmaline reefs. The heavy timber has retarded exploration, and, until recently, not much work has been done in the way of discovering the sources of the alluvial ore. Some strong syndicates have lately taken up a good deal of the ground, and prospecting work is being carried on.

Mount Farrell.

Mr. Waller also reported on this mineral district. The North Mt. Farrell and Murchison River Mines were being worked. The former is the premier mine of the field, and has a lode with good shoots of first-class ore (galena) and large quantities of concentrating ore.

The Murchison River Mine is a promising one; its ore, zinciferous galena, will have to be concentrated, in order to overcome the heavy freight charges. The Mackintosh Mine has also a promising lode.

On Kittson's section, 4 miles from the Farrell township, a wide formation has been traced and cut into, charged with iron and copper pyrites, and containing seams and bunches of rich silver and bismuth ore; assays from different points on the course of the lode returning from 100 to 350 ozs. silver per ton.

The Zeehan Silver-lead Field.

The report on this field, made by Mr. Waller, is comprehensive and instructive. It is accompanied by the map referred to in my last annual report, and which exhibits the principal lodes and topography very clearly. In the report, the lodes are connected genetically with the Heemskirk granite. The geology of the district is dealt with at length, and the individual mines are described with great care and judgment.

Mineral Areas.

In November I made an examination of the tin-bearing granite country round Branxholm, Derby, Moorina, Pioneer, Weldborough, Lottah, and Blue Tier, in order to report upon the nature of the lands for the purchase of which numerous applications have been made lately. This country is the great storehouse and source of the tin ore which is now being so usily worked. The conclusion which I arrived at was, that razing leases would answer every requirement, but that it ould be highly undesirable to part with the fee simple of land hich is the mainstay of our tin-mining industry in this part the island.

Progress Reports.

have compiled four Quarterly Reports on the mining ustry during the year. I am at all times ready to acknow- ge thankfully any information respecting work and prospects ch mining or legal managers may be able to send me. I not think it is generally known how widely these publica- s circulate, and how useful a channel they are for dis- ting knowledge respecting the mines of the State. rtunately, the Customs' returns of mineral exports are nger available, and consequently the figures which repre- the quarterly production of mineral have to be obtained those in charge of the various mines. It is hoped that mpanies and managers will co-operate in furnishing the ics required.

Office.

ng the year, eight geological and four progress reports ssued. The correspondence has comprised 2800 letters out. The office library has been enriched by 106 volumes of the United States Geological Survey, mono- and bulletins, donated by the United States Govern- s well as by the annual and other publications of the

Mining Departments of the various States in the Commonwealth and kindred institutions throughout the world.

A representative collection of Victorian rocks has been received from the University of Melbourne, under direction from Dr. Gregory, late Director of the Geological Survey of Victoria, for which grateful acknowledgment is tendered. Mr. W. R. Bell, of Burnie, has kindly donated various minerals to the office collection.

A collection of Tasmanian rocks and minerals has been prepared (by request) for the Workingmen's College, Melbourne, and will be forwarded shortly. A collection of Tasmanian tin ores and rocks was got together for an English author, who is preparing a work on the world's tin deposits.

Mr. F. S. Grove has continued to discharge his duties with efficiency.

Government Drills.

The diamond-drills have not been at work this year. The alluvial boring plant, which was lent to Messrs. Medwin and Traill for testing coal measures on the River Tamar, was used for boring into the lignite clays and sands. These were penetrated to a depth of 200 feet, without any signs of the appearance of underlying coal-bearing beds.

Geological Surveyor.

Mr. G. A. Waller, having obtained a private position in Australia, retired from the Service on the 16th April. He was an officer who always discharged the duties which were confided to him in a painstaking and efficient manner.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES, *Government Geologist.*

W. H. WALLACE, *Esq., Secretary for Mines, Hobart.*

REPORT OF THE CHIEF INSPECTOR OF MINES.

Inspector of Mines' Office,
Launceston, 31st December, 1904.

SIR,

I HAVE the honour to present my Report on the inspection of mines for the year ending 31st December instant.

I beg to append statistical tables relating to accidents which have occurred at the mines during the past year, and the annual reports of Mr. M. J. Griffin, Inspector of Mines for the Northern and Southern, Eastern and North-Eastern Mining Divisions; of Mr. Jas. Harrison, Inspector of Mines for the Western and North-Western Divisions; and of Mr. Con. H. Curtain, Inspector of Mines for the Lyell District.

Mr. G. A. Waller, who was charged with the inspection of the Lyell District at the beginning of the year, left the State for a more lucrative appointment in April, and Mr. Curtain was reinstated in his old position.

The number of persons engaged this year in mines and smelting works was 6194. Nine persons were killed; and other serious injuries were 65. The death-rate from accidents was 1·453 per thousand, compared with 1·428 the preceding half-year. The fatal accidents were distributed as follows:—Northern and Southern Division, 1; North-Eastern, 2; Eastern, 2; and Western, 4. In the Western Division, 2 occurred in the Lyell District and 2 at Mt. Read.

Although the fatality-rate has not increased appreciably, the number of accidents proportionately to men employed has exceeded that in any of the twelve preceding years. The great majority of the accidents have happened in the large mines of the State; those belonging to the smaller mines being comparatively few. The circumstances of every serious accident have been carefully examined by the Inspectors, and proceedings have been instituted where good grounds for doing so appeared to exist. Numerous suggestions have been made for the prevention of accidents. The nature of the accidents registered will be gathered from the annexed tabular statements and the reports of the Inspectors. It was deemed necessary to take proceedings with respect to three accidents attended or caused by breaches of The Mining Act. In each case a verdict was obtained.

A gratifying approach to uniformity in recording accidents for the future has been made possible, as the result of correspondence with the other States of the Commonwealth. All the States, excepting New South Wales, which has not yet come to a decision, have practically agreed to register accidents which entail a fortnight's disablement, and from the 1st January this rule will be adhered to in Tasmania.

An alteration in the wording of Section 89, providing for the notification of accidents attended with serious injury to any person is desirable, in the direction either of having all accidents reported, however trivial, or of defining the term "serious injury." In Indian mining legislation, this means any injury which involves, or is likely to involve, loss of or permanent injury to any limb, or to the sight or hearing, or which occasioned fracture of the head or of any limb, or a dislocation of any limb, or enforced absence from work for fourteen days, or any injury which is declared by any medical officer to be serious. Personally, I should prefer all accidents to be notified, but there seems to be a consensus of opinion that a definition of serious injury would be more acceptable. It will do away with the present inadequate wording of the section, which allows managers to defeat the obvious intention of the Act by interpreting the terms from their own standpoint.

Inspector Griffin has been removed from Gladstone to Launceston. This position, being more central, is more convenient for inspection journeys, which can be arranged on a better plan, and will have better results, so far as these depend on efficiency of inspection.

Correspondence with the Inspectors has been carried on with a view of suggesting improvements which might be introduced into Part VI. of The Mining Act. Several matters of importance have been discussed, but a personal conference with the Inspectors on the West Coast is necessary before finality can be reached. The results of discussions, with numerous suggestions, will be submitted to you, with the view to the amendment of that part of the present Act which deals with the working and regulation of mines.

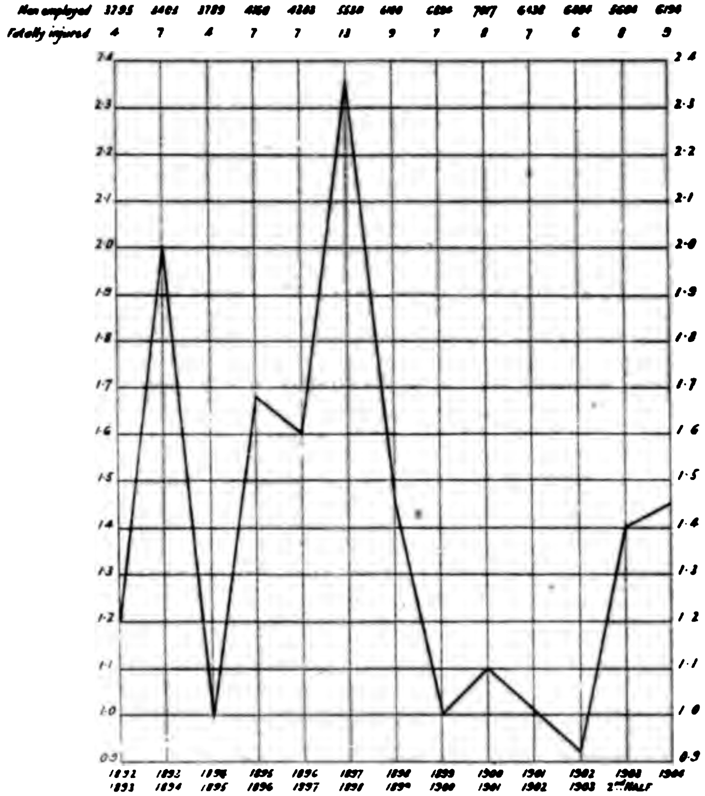
To the Inspectors, this year again, as usual, is due an acknowledgment of their unremitting attention to, and conscientious discharge of, the important duties which devolve upon them.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES, *Chief Inspector of Mines.*

W. H. Wallace, *Esq., Secretary for Mines, Hobart.*

Diagram showing the ratio of fatal accidents in mines in Tasmania
Rate per 1000 men employed



John Vail, Government Printer, Tasmania.

TABLE showing rate per thousand Killed and Injured in the different Mining Divisions for the Year 1904.

Period.	Division.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
				Killed.	Injured.			Killed.	Injured.
1 Jan. to 31 Dec., 1904	Northern and Southern	785·5	17	1	16	17	21·642	1·273	20·369
Ditto	North-Western	394·0	1	—	1	1	2·538	—	2·538
Ditto	North-Eastern	640·0	13	2	11	13	20·312	3·125	17·187
Ditto	Eastern	850·0	12	2	10	12	14·128	2·353	11·765
Ditto	Western	3524·5	30	4	27	31	8·796	1·135	7·661
		6194·0	73	9	65	74			

Analysis of Statistics for the Western Division.

Division.	District.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
				Killed.	Injured.			Killed.	Injured.
Western	Mount Lyell	2119·5	18	2	16	18	8·492	0·943	7·549
	Zeehan, &c.	1405·0	12	2	11	13	9·253	1·423	7·829

TABLE showing the Number of Persons Killed and Injured in and about the Mines of Tasmania during the Year 1904.

PLACE OR CAUSE OF ACCIDENT.	INSPECTION DISTRICT.												TOTAL.	
	Northern and Southern Division.		North-Eastern Division.		Eastern Division.		North-Western Division.		Western Division.					
									Zeehan and other Districts.		Lyell District.			
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
UNDERGROUND—														
Falls of Ground	...	1	...	...	1	1	...	...	...	5	...	2	1	9
Shaft Accidents—														
Suffocation by natural gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Overwinding	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	...	1	...	...	...	...	...	...	...	2	...	...	...	3
Falling in or into shafts.	...	2	...	...	1	1	...	...	...	1	...	1	1	5
Things falling into shafts	...	1	...	...	...	1	...	...	...	...	...	...	...	2
Explosives	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Total	...	4	...	...	1	2	...	...	...	3	...	2	1	11

		...	...	...	...	1	...	...	2	...	...	...	2	1
gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
age—														
On inclined planes	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
By trams and tubs	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sundries	...	6	...	...	...	...	...	...	...	...	...	2	...	8
Total	...	6	...	...	...	1	...	...	2	...	...	2	2	9
Total underground	...	11	...	...	2	4	...	...	2	8	...	6	4	29
ON SURFACE—														
Electrical	...	...	...	...	...	...	...	...	...	...	1	...	1	...
Smelting Works	...	...	...	...	...	...	...	...	...	2	...	...	...	2
Machinery	1	1	...	...	...	2	...	...	...	...	...	2	1	5
Boiler explosions	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tramways	...	...	...	2	...	1	...	...	...	...	...	1	...	4
Explosives	...	...	...	...	...	2	...	...	...	...	1	3	1	5
Falls of ground	...	...	1	1	...	...	...	...	...	...	...	...	1	1
Miscellaneous	...	4	1	8	...	1	...	1	...	1	...	4	1	19
Total on surface	1	5	2	11	...	6	...	1	...	3	2	10	5	36
GROSS TOTAL	1	16	2	11	2	10	...	1	2	11	2	16	9	65

COMPARATIVE Table of Statistics of Accidents in and about the Mines of Tasmania from 1st July, 1892, to 31st December, 1904.

Period.	Number of Miners employed.	Number of Accidents.	Number of Persons.		Total killed and injured.	Average per 1000 killed and injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
1 July 1892, to 30 June, 1893	3295	28	4	25	29	8·8001	1·214	7·587
„ 1893 „ 1894	3403	25	7	20	27	7·934	2·057	5·877
„ 1894 „ 1895	3789	26	4	24	28	7·390	1·058	6·332
„ 1895 „ 1896	4160	22	7	16	23	5·529	1·682	3·847
„ 1896 „ 1897	4303	36	7	31	38	8·831	1·627	7·204
„ 1897 „ 1898	5530	36	13	33	46	8·318	2·351	5·967
„ 1898 „ 1899	6180	35	9	34	43	6·957	1·456	5·501
„ 1899 „ 1900	6834	19	7	16	23	3·365	1·024	2·341
„ 1900 „ 1901	7017	29	8	23	31	4·418	1·140	3·278
„ 1901 „ 1902	6438	38	7	35	42	6·524	1·087	5·437
„ 1902 „ 1903	6484	44	6	43	49	7·557	0·925	6·632
30 June, 1903, to 31 Dec., 1903	5604	27	8	20	28	4·997	1·428	3·569
1 Jan. 1904, to 31 Dec. 1904	6194	73	9	65	74	11·947	1·453	10·494

REPORTS OF INSPECTORS OF MINES.

Mr. **Inspector Griffin** (stationed at Launceston) reports:—

I have the honour to submit my annual report for the Divisions Northern and Southern, North-Eastern and Eastern, inspected by me during the year ending 31st December, 1904.

Accidents.—Five fatal and thirty-six non-fatal occurred during the year. Of the non-fatal accidents, some five or six were serious, with broken limbs, and in two cases loss of eyesight, caused by explosions of gelignite, the remainder being of a trivial nature. The fatal accidents were purely accidental, and no blame was attachable to anyone for them.

Fatal Accidents.—Henry Wilson, a married man, was employed at the New Golden Gate Mine, Mathinna, trucking mullock from one pass to another at the No. 1 level. He worked by himself, and was last seen alive about 2 o'clock in the afternoon of the day of the accident by J. Street, who worked, also trucking, on the next or adit level above, and who called Wilson to help him to free the pass, which was hung up. Two hours later, at change of shift, Wilson was missing. The man that went to relieve him found his coat, waistcoat, and billycan about 4 feet back from the mouth of the pass, into which Wilson was tipping the mullock. A search was made, and his dead body found in this same pass 380 feet down from the top. He could not possibly have fallen into the pass during the time he was tipping the truck, as the latter completely covered the top opening. It would seem that he pulled the empty truck back some 6 feet past a recess, into which he would have to step, as there was only room for getting past it in this way, and then, in some way, got into the pass. It has since transpired that he was subject to fainting fits; also, that on leaving his home to go to work on that morning he seemed absent-minded and troubled, having only on the previous day returned from attending the funeral of a brother. The drive was well lighted at different places; the candle nearest the pass was found lying on the ground, but not alight.

Michael Conlan, a single man, aged 24 years, was engaged as leader of shift in the open-cut workings of the Briseis Tin Mine, at Derby. Basaltic rock and stones were being trucked out. Conlan went up the wet, slippery pile of stones to bar down, lost his footing, and fell or rolled down some few feet. A large stone rolled against his side as he lay prostrate. He was, apparently, not much hurt at the time, nor did he feel particularly bad the next day. On the third day, however, alarming symptoms set in, and the local doctor advised his removal to the Launceston Hospital, where he was received on the 30th April. An operation had to be performed at once, but he never rallied, and died a few hours after this took place, from inflammation caused through, it is stated, twisting of the bowels.

Thomas Richard Miller, a lad 16 years of age, was engaged as apprenticed fitter at the fitters' shop of the Tasmania Gold Mine, Beaconsfield. He had only been a few days at the works. Part of his duty was to oil the machinery, but he was cautioned not to attempt to do so while it was in motion. Even on the day of the accident the foreman, McSkimmney, called him back as he was about to ascend to the counter shafting close up to the roof. He must have gone into another compartment, and ascended from there. A fitter, James Cannon, noticed something wrong, and ran to stop the machinery, but before he could do so the unfortunate lad's body was dragged violently between shafting and pulleys running close together and his neck dislocated. Death was instantaneous. No person was to blame. The shafting was rather awkwardly placed for getting at, but could be attended to with perfect safety when not in motion.

Alexander John Lang, a single man, aged 21 years, one of a party of six contractors, was engaged driving at south drive, No. 13 level, New Golden Gate Mine. The face was about 20 feet in advance of the timbering. The manager, Mr. Andrews, was below on the day before the accident happened. He noticed the ground in the backs was unsafe, and ordered the men then on shift to take down some loose rock and make the drive secure. Lang and his mate, Wm. Fox, followed on the next shift, and they, in turn, proceeded with the pulling down of the unsafe rock; but for some reason, did not complete the work. When questioned as to why they did not do this by the shift boss, Moses, Lang replied that it was no use trying to get it down until a certain bump further back and 5 feet from the timbering was removed, as he said that was the key to the whole thing. Nothing further appears to have been done until Lang and Fox came on again on day-shift the following day, when Fox proceeded to pick down the bump already referred to by Lang as "the key to the whole lot"; but, marvellous to relate, he (Lang) knowing the danger, stood watching his mate, and immediately beneath baulked ground, until he was caught and killed by the falling mass of rock. Fox, too, was knocked down, and partly buried by rock, some legs that were uprighted and the trolly he was standing on having broken the fall and saved him from being instantly killed. The injuries he received were severe, and he was eight weeks off work, but is now all right. This is the second narrow escape of death he has had. In June, 1901, he made a brave attempt to rescue his mate, Wm. J. Thomas, who was suffocated by foul gas in the Moonlight-cum-Wonder, at Beaconsfield, and was himself overcome.

Francis Joseph Robinson was employed loading trucks with stone in the upper cascade open-cut face of the Briseis Tin Mine. The face, from 25 to 30 feet in height, is composed of columnar basalt, generally very hard and difficult to break down; some portions are, however, decayed, and treacherous. A fall, extending from the bottom upwards for about 10 feet by a width of 12 or 13 feet, came suddenly away, a large stone striking Robinson on the right leg just above the ankle. He was thrown backwards with great force, the back of his head coming in contact with a stone, causing a fracture of the base of the skull, from which he died within a half-hour from the time of the accident. The verdict of the Coroner's jury was, "Accidentally killed, no blame attachable to anyone," a verdict in which I entirely concur. Every reasonable precaution for the safety of the men employed is being taken by the management of this mine, and although it would seem that the face where the accident happened was worked too near to the vertical, yet, from its very structure, this columnar basalt is so worked, as a rule, without incurring any great risk. Close inspection three hours before the accident happened revealed no flaw or sign of danger.

Serious Accidents.—Samuel Lee-Count was engaged at top of full pass of quartz, at stope in Golden Gate Mine; stone in pass suddenly dropped a few feet, letting him down, when the stone from the rill rolled in about him. He was soon discovered, but it took three hours to extricate him. He was much bruised, but no bones were broken, and he was enabled to return to work within a week or so.

Lewis Bear was charging a hole with gelignite at the Volunteer Consolidated Mine, Mathinna. When pressing the first plug into the drill-hole with a wooden tamping-bar, it exploded. He received a severe scorching and laceration of the hands and arms, but no further injuries. So far as can be ascertained, the gelignite being used was in a normal condition, and it is difficult to understand what caused the explosion, unless it was friction from a dirty tamping-stick used as a rammer to force the plug in a tight hole. The injured man denies that any undue force was used, and says the plug of gelignite did not stick in the hole.

Hugh Parry, assistant tin-dresser at the Anchor Tin Mine, relieved one of the battery-feeders for a few minutes at crib time, and during the absence of the latter, attempted to put the belt on a driving-pulley to start a five-head set of stamps. He failed to pull the slip-knot of a lace tying the belt on to the driving-pulley loose at the first revolution after the machinery started. The belting was jerked off the large camshaft pulley overhead, and falling, caught and dragged Parry against the driving-pulley, breaking both his legs below the knees; other injuries received were of a trifling nature. Prompt action on the part of J. Edwards, who was at the starting-valve, in stopping the machinery, saved Parry from being killed.

John Eager was working in a gullet-rock cutting at the Anchor Tin Mine. A lift was being taken off 15 feet higher, from which men were wheeling out stone; a barrow-load was accidentally tipped, some of its contents rolling down into the cutting. One piece of stone struck Eager, and broke his left leg just above the ankle.

Charles Berwick was engaged as powder-monkey at the Anchor Tin Mine, and whilst charging a number of drill-holes (pops) in boulders, a premature explosion took place, causing severe injuries to his hands and face, and completely destroying the sight of both eyes. The gelignite he was using was in a frozen state, and should not have been used without having first been thawed or softened in a proper vessel for the purpose. According to the statement of the injured man, he had put one plug into the drill-hole without difficulty;

a second one stuck, and when he attempted to force it home with a wooden tamping-stick, it exploded, causing the injuries referred to.

Thomas Imlach was employed at No. 1 face, Anchor Tin Mine, jumping holes in boulders and large blocks of rock. Some twenty of these holes were charged, and fired late in the evening by chief foreman Herrick and assistant powder-monkey Mills, who, according to their own statements, satisfied themselves that all the charges had exploded. Imlach returned to work the following morning, and noticing that one block of rock, in the midst of those charged and exploded the night before, and in which there was a drill-hole, remained unbroken, and thinking that this was overlooked and not charged at all by Herrick or Mills, proceeded to clean out the drill-hole, which was partly filled with dirt. In doing so he used the steel jumper he had in his hand. The first blow struck caused an explosion, from which he received two nasty cuts on the left thigh and temple respectively, together with a severe peppering of dust and small particles about the face and head, resulting in the loss of the sight of his right eye. There was, he (Imlach) asserts, no sign of fuse, or anything to indicate that the hole contained explosive. It is quite likely that in charging a number of holes close together that a plug of gelignite was dropped into the one from which the accident proceeded, and that no primer or fuse was added. Such a thing could easily have happened, but there is no excuse for the persons who charged and fired the holes not discovering, by careful inspection after the explosions, that this one was left unexploded. Had they done so, the accident could not have happened.

David Macrostie, employed at the Tasmania Gold Mine, Beaconsfield, was mending a sieve. A long piece of wire sprang out, one end striking him in the right eye, and completely destroying the sight.

John Goodman, employed at repairing work in the Florence shaft at the Tasmania Gold Mine, slipped, and fell across a tie-lath, breaking one rib. He worked two shifts after the accident, but had to desist, and was off for some considerable time.

Richard Thomas Beswick, while taking off a valve from a pipe at the Briseis Tin Mine, slipped, and fell, twisting and breaking the small bone of one arm. He was off work for three or four weeks.

H. Gough was preparing to put a head on a stamper-shank in the Anchor Tin Mine battery. The shank slipped in the slings, and jammed three of his fingers badly. Amputation was not, however found necessary, and having to remain off work for some considerable time was the greatest loss to the sufferer.

Wm. Fox was severely, but not permanently, injured by a fall of rock in the south drive, No. 13 level, of the New Golden Gate Mine, in the same accident that caused the death of his mate, Alexander J. Lang, referred to in this report under heading "Fatal Accidents," and where particulars of this accident to Fox are already given.

Henry Wilson was jumping a hole in a large lump of cement in the Pioneer Tin Mining Company's open-cut face. The boulder, or lump, suddenly split open, letting him fall between, where he was jammed by one half rôlling on him and causing injury to one arm, which necessitated his keeping off work for about four weeks.

Oliver Miller was horse-driving, trucking stone from stonebreaker to battery at the Anchor Tin Mine. The empty truck came off the rails; when trying to get it on, the horse started suddenly, and the wheel caught Miller on the leg, bruising it badly. The doctor thought the bone was splintered. The sufferer was conveyed to the Launceston General Hospital.

Accidents of a less serious or of a trivial nature.—John Simpson was repairing at 718-ft. level in the Tasmania Gold Mine. A run of ground occurred. He was partly buried, and received some bruises, but not of a serious nature.

Joseph Goldsworthy (pitman), while attending to lift in pump-shaft at the Tasmania Gold Mine, put his foot too far through, and got his toes jammed by a descending cage; not very serious.

William Dobie, while lifting a cap and placing it in position at the Tasmania Mine, got his hand rather badly jammed.

Frank Cook, while placing stope-timber in position at Tasmania Gold Mine, lost his footing and fell down the underlay footwall about 7 feet, and jarred his back. He was off work for a few days.

Henry Grachan slipped down ladder-way in stope at Tasmania Gold Mine, fell on his shoulder, and ricked his neck; was off work for some days with stiff neck and shoulder.

Grainger Williams was going down ladderway into stope at Tasmania Gold Mine; he slipped, and fell some 10 feet, getting a shaking; not serious.

William Underhill was hurrying out a last truck at the Briseis Tin Mine. It left the rails; he got a fall, but was at work again the next day. On the third day he complained of pains inwardly. The doctor saw him, and advised rest. He returned to work after a week's absence, apparently all right.

James Goodman was struck in the eye by a splinter of rock flying from the pick-head while working in the Tasmania Gold Mine. He was off work for a few days. No serious results.

James Johnstone, while putting a chock behind a lath in a drive at the Tasmania Gold Mine, had the first joint of one finger taken off; he thinks, by the tomahawk he was using, but is not sure of this. He returned to work within a week.

Wm. Albert O'Connor was attending to a nozzle at the Briseis Tin Mine open-cut face. In endeavouring to pull it round, he slipped, and fell off a low staging, receiving a shaking and some injury to his face, but not serious.

George Banks was coming down a low ladder at open-cut at the Briseis Tin Mine; slipping, and falling on a peg, received some injury that necessitated a visit to Launceston. He is now all right again.

Wm. Isaac Arnold, while lifting a truck back on to the rails, at the Briseis Tin Mine, jammed his hand rather badly against a piece of cement.

Frederick Clarence Peck was horse-driving at the Briseis Tin Mine. He allowed the truck to run on to the horse's heels, and was, himself, knocked down and had his leg badly bruised.

Lewis Blulle was dismantling a fluming at the Briseis Mine, and in the act of drawing a nail, slipped, and fell back against the side of the race. He got a severe shaking.

Henry Cottereill was helping to remove a heavy case of machinery at the Tasmania Gold Mine, when he slipped, and jammed his leg against the skids.

James Willey is some way jammed his finger at the Tasmania Gold Mine, and had to leave work for some days, the injury resulting in a poisoned finger.

Cecil Russel Holland, while working at hopperings on the Briseis Mine, was accidentally struck with a pick on the back of the head, the point cutting to the bone. He was attended by a doctor, who said the wound was not dangerous, it being on the thickest part of the skull where the pick struck.

Wm. Gracham, while working at main pump at the Tasmania Gold Mine, let the clack-door fall on his toes. No bones broken; soon all right again.

Frederick Holroyd, while shifting cases of machinery at the Tasmania Gold Mine, twisted his ankle, breaking the small bone.

George Pearson, while acting as temporary ganger on surface at Tasmania Gold Mine, inadvertently walked into an ash-pit, and broke one rib in the fall.

Edward Green fell down a mullock-pass at the Tasmania Gold Mine, and got a good shaking, but was soon all right again, although he did not return to work for three weeks.

James Mulville was helping to carry a water-pipe at the Briseis Tin Mine. He slipped and fell, the pipe end striking him on the chest. He seemed little the worst for the mishap, and worked on for a week, when he complained of pain in the chest. The doctor could, at first, find nothing seriously wrong, but said the man was not in good health, or robust, at best; later on he discovered a broken rib, that was the cause of the pain felt. Mulville was six weeks off work.

Wm. Jeffries was erecting a barricade to prevent stones, hopperings, &c., from rolling into a face where he was working at the Briseis Mine. He was struck on the shin by a stone, receiving a nasty wound. Was off work, and attended by the doctor, for a week.

Of the foregoing accidents reported during the year, the Tasmania Gold Mine has 18 out of 41; but this is brought about by the fact that all accidents, no matter of how trivial a nature they may be, occurring on that mine are reported to the Inspector. If the same course were followed on all the mines, it would be seen that the rate per 1000 men employed would not be greater on this mine than it probably is on any of the other mines in these Divisions. Many of the mine managers have an aversion to reporting accidents that occur on the mine of which they have charge, and content themselves by reporting only accidents of a very serious nature should such occur. It would, I consider, be an improvement if the wording of Section 89 of the Act were altered, so as to require all accidents occurring on a mine to be reported to the Inspector. It often happens that accidents, apparently of a very trivial nature at the time of their occurrence, are, after all, only narrow escapes from what might easily have been attended with serious consequences, and if not reported, there would be no opportunity for investigation as to the cause, or as to whether anyone was to blame for the accident.

Inspection Duties.—Since my removal from Gladstone to Launceston, and being relieved of the management of the Mount Cameron Water-race, I am enabled to visit oftener and give more attention generally to the inspection of mines in the Divisions under my charge. The principal mines, and those requiring most attention from the Inspector, can be visited at intervals of two months, exclusive of special visits when serious accidents occur. Most of the others are visited quarterly, and some few, such as the coal mines in the South, twice a year. Having the inspection of magazines, outside mining fields, takes a good deal of my time.

Safety-cages and hooks, ropes, chains, shackles, and hauling appliances generally have been inspected and tested regularly. One safety-cage was condemned; others were found defective, and ordered to be replaced by spare ones on hand. Two windlass-ropes were condemned; also one engine-hauling rope. As a rule, the hauling-ropes on the large mines receive careful attention, being overhauled every week, frequently cleaned and oiled, or removed altogether should there be any defects that shortening or reversing would not overcome. One horse-whim used for hauling from a shaft over 400 feet in depth was found unsafe, and was condemned.

Ventilation.—This was generally satisfactory. There is still room for improvement at the Tasmania Gold Mine, Beaconsfield. No doubt, when the new machinery is erected and the mine unwatered to the 1000-feet level at Hart's shaft, and a connection with the old workings made, the ventilation can easily be improved. At the New Golden Gate Gold Mine a rise (south) from the bottom, 1600-feet level, has been carried through to the surface, and a great improvement in the ventilation effected. It is, however, disappointing to find that the new connection is working as a down-cast, and that the up-cast is in the main working shaft; thus, the whole of the ventilated air from the mine escapes to the surface in this direction. The principle is wrong, as, in the event of a fire in the mine getting a hold of the dry timbers in the upper levels, the smoke and fumes would travel to the main shaft, which is the only means by which the men could escape in a cage to the surface. The rise airway, if carried up about 30 feet above its present surface-level, which is about the same as the main shaft brace, could be easily converted into an up-cast; the main working shaft would then be the down-cast, and the risk above referred to obviated.

Complaints Made.—Only one formal complaint in writing, as required by Section 97 of the Act, was made. This received prompt attention. In this case shaft-sinking below a 200-feet level had been commenced after one of my visits. The complaint received was to the effect that the 4-h.p. single-cylinder engine used for hauling was not powerful enough, nor to be depended upon to get the men away after firing; that there was no proper ladder-way from the plat downwards, or chain-ladder at bottom; that the braceman employed was under the required age; and finally, that the enginedriver worked over 8 hours per day. I found, on investigation, that these charges were mainly correct, the worst feature being that not only was there no proper provision made for the men to ascend to the plat when shots were fired, but that the main ladderway was blocked in such a way—the steam-pump being placed in it—as to leave no room for men to get up or down. The defects had to be promptly remedied. The miner from whom the complaint was received deserves credit for having reported dangers that, if not remedied, might easily lead to bad accidents.

Prosecutions.—It was found necessary to proceed against the mine manager, two foremen, and one employee of the Anchor Tin Mine, under two separate and distinct charges; the first of these being against the mine manager and one of his foremen, for having failed and neglected to provide proper means for thawing a nitro-glycerine compound (gelignite) when in a frozen state, and for allowing it to be used in such frozen state, contrary to Section 94, Sub-section II., (*k*), (*l*), of "The Mining Act, 1900." A very serious accident occurred on the mine, by which an employee, one, Charles Berwick, had the sight of both of his eyes completely destroyed, and received other injuries, when, as powder-monkey, he was charging a drill-hole with frozen gelignite, and a premature explosion took place. Both defendants pleaded guilty to a technical breach of the Act and Regulations, through their counsel, who informed Mr. Commissioner Hall, before whom the charges were heard, that his clients in no way admitted that the frozen state of the gelignite caused the premature explosion by which Berwick was injured. In the other case, the chief foreman and an assistant powder-monkey were charged with having failed to take necessary and reasonable precautions in the charging and firing of several holes, to ascertain whether all of such charges had exploded, and further, with not having discovered and reported as a missfire one of the charges so laid, thus causing an accident by which a person was injured. In this case the person injured was one, Thomas Imlach, whose duty it was to drill pop-holes in boulders and blocks of stone in the face-level, and who, having returned to his work on the day following the evening in which the holes above referred to were charged and fired by the defendants, discovered one hole in a block of stone which, to all appearance, there being no sign of fuse visible or of partial explosion having taken place, he believed was overlooked and not charged at all. He proceeded to clean out the hole, partly filled with dirt, and prepare it for charging, using a steel jumper which he carried in his hand, when an explosion occurred by which he lost the sight of one eye and received other injuries. A plea of guilty was obtained from the person assisting as powder-monkey; the charge against the chief foreman was then withdrawn. The penalties and costs awarded against the defendants in these cases amounted to about £20.

I very much regret the necessity for taking action in the foregoing cases, but there was undoubted evidence of a great want of care and absence of necessary precautions for the safety of the men employed. Had proper precautions been taken, the unfortunate accidents, causing life-long injuries to two men, would in all probability have been avoided.

Magazines.—The storing of explosives at the surface is generally satisfactory. The magazines are well protected, and kept clean, dry, and well ventilated. Underground, however, things are not, as a rule, so good, and a good deal of trouble is experienced in getting proper provision made for the storing of the quantity allowed by the Regulations. Even when such provision is made by the management, the men cannot always be got to observe the rules—naked lights are taken into the magazine, package-papers and other inflammable substances are left strewn about, &c.; contract parties must each have their own box or locker, and think they have a perfect right to carry and place such boxes, irrespective of the quantity of explosive they may contain, to and in any part of the level they work at. I do not know that the final paragraph in Sub-section XLIII., Section 94, of the Act, "Every miner on being engaged is to be supplied with a copy of the Rules," has in any way improved matters. Year by year the percentage of accidents due to carelessness on the part of the men themselves is on the increase.

COAL MINES.

Cornwall Colliery.—Some trouble was experienced through the thickening of a 3-inch band in their 6-feet principal working seam, which rendered the profitable working of the coal below the band (about 18 inches) useless. It was therefore decided to work the upper portion of the seam, about 4 feet of coal, between the band and the roof, and this has been done since the early part of the year, with good results. The working of the colliery, so far as safety is concerned, was generally satisfactory. Ventilation, at times, was rather dull, but this will be improved in a very short time, so soon as a new back-heading, giving a more direct and roomy return airway is connected. The main heading is still being carried forward, and is now in 45 chains from the entrance. No faulting of the seam has been met with during the year. Twenty-six places, cord and pillar. are being worked for coal.

Mt. Nicholas Colliery.—The working of this colliery for the year was generally satisfactory. Faulting of the seam still continues, and makes "long-wall" working difficult. These faults have an approximately north and south strike, and cross the main heading, which is going about north-easterly at a long angle. For some time past they occurred as rolls of from 2 to 3 feet; latterly, however, a greater difference of level is noticeable, the last one cut by the main heading being a "down-throw" of about 8 feet. Both drainage and ventilation are made more difficult by these faults, and the roof being broken makes it bad for long-wall working. A drive has been extended from the first right-hand working place to daylight on the south-east slope of the hill; this was mainly for drainage purposes, but can be used as a means of escape,

if required, and also to assist ventilation. Most of the working places (there are 16 in all) are now on the west or north-west side of the main heading, the faulting of the seam being less troublesome on this side.

Dulverton Colliery.—**I have had a good deal of trouble in enforcing a reasonably safe system of working at this colliery. Orders given for improving and properly securing the main adit-heading were at first ignored; it was only when a peremptory order prohibiting further work in the coal faces until this heading was made secure was given that an improvement was effected. This was in the early part of the year; later on, it would appear that the old careless and slovenly system of working was reverted to, and it was found, on the men going to work one morning, that a large portion of the tunnel-roof had collapsed. The manager reported that it had been tampered with by some person during the night. Much noise was made about this by the proprietors. I was unable to get into the heading or tunnel when a visit to the colliery was made later on, but from what could be seen of a subsidence at the surface, and knowing the bad system of timbering usually adopted at the mine, I have not the least doubt that this was the cause of the accident, and that it was not tampered with by outsiders. Work has since been carried on in an old tunnel; here, again, there was danger of accident, and necessary repairs had to be insisted on. I have to complain of repeated evasions on the part of the owner, for, although called a company, this mine is controlled by one Launceston gentleman, and the mine manager, both of whom are bent on getting coal as cheaply as possible, and without a proper regard for the safety of the men employed.**

Teasdale Dulverton Mine.—Not much doing at the Teasdale Dulverton Mine. Rolls and faulting are the trouble there. It is, however, worked in an intelligent and fairly safe way.

Spreyton.—Not much doing at Mr. Allison's pit. The new works west of the valley had to be abandoned for a time, on account of an influx of water. A return to the old workings on the east side was made; even here, not much was being done at the time of my last visit.

Mr. Bound is getting some coal out of his Illamatha Colliery, and the workings are in fairly good order.

Sandfly and Mount Cygnet Collieries.—My last visit to these was about the end of September.

At the Sandfly, the main heading was in 260 feet, working to the dip. The system of working, although safe enough, is by no means the most economical way of opening up a new coal mine. A want of experienced coalminers is no doubt the cause of this. The coal is evidently of good quality, and the prospects of the mine warrant more skilful engineering to commence with.

Mount Cygnet Colliery.—Did not find much to complain of at this mine, with the exception that man-holes as places of refuge in the tunnel engine-hauling inclined plane, ordered on a previous visit, had not been attended to. The manager's contention that there is ample room for men to escape injury from the skips passing will not do, and proper places must be provided. The dip of the seam is considerable, and haulage, therefore, more difficult. A year ago a new winding-engine was provided. The working places had passed into more settled country, faulting of the seam was less frequent, and a better time generally for the colliery was anticipated; unfortunately, however, another down-throw fault met with has seriously interfered with coal-getting.

Colebrook.—Nothing doing at this place at time of my last visit in September. A caretaker, who was in charge, informed me that the pit was idle, pending some settlement of a dispute between the owners and the tributors.

The Marialva Company has taken over Morrison's Glenleith Coal Mine, and will work it in conjunction with the Marialva should the latter ever commence operations again.

York Plains Coal Mine.—The property on which this is situated has recently been purchased by Mr. J. C. Gregg, who for some years has occupied it for pastoral purposes. It is, I understand, his intention to work the coal on a more extensive scale than has hitherto been the case. The coal (anthracitic) being almost smokeless, is mainly used by brewers, and its sale is therefore limited. The seam is worked to the dip by means of tunnels from the south-west and west side of the hill. The method of working is not always satisfactory. At time of last visit I found the roof, where men were working in a bord off an old tunnel, in a very bad condition, and had to order timbering, and better precautions for safety to be taken.

New Mines Opened.—Only a few mines have been added to the list for inspection during the year. At Blythe River, the Copper King (Clarke & Sice) has been started, and promises to come permanently on to the list of working mines. The Commonwealth Copper Syndicate, in the same locality, made a commencement by putting in a tunnel, but was not working at time of my last visit. The Blythe Iron Company had men prospecting for copper on its leases, where some tunnelling was going on. At Beaconsfield no new mine has been opened. The King Victor, working in the early part of the year, has shut down. The Tasman United, Tasmania West Extended, and Moonlight-cum-Wonder are all idle. Only two have been added to the list at Mathinna, the South Miner's Dream and the Victorian New Golden Gate, both of which are tunnelling. The Golden King Mine has recently ceased operations.

LIST of Accidents in Inspector Griffin's District for the Year 1904.

Fatal, 5 ; non-fatal, 37 ; total, 42.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1904. 7 Jan.	Tasmania G.M.	Beaconsfield	Fall of earth	John Simpson	Married	Bruises on body	Was repairing 715-feet level. When removing cap-piece a run of earth took place, and Simpson was partially buried. He only received a few slight bruises.
23 Jan.	New Golden Gate	Mathinna	Fell into quartz pass	Samuel Lee-Count	Ditto	Bruises on shoulders and legs	Was raking quartz into pass; filled pass to collar and stood on top of the quartz, which dropped about 6 feet. Other quartz from the rill fell into pass and buried him.
22 Feb.	Tasmania G.M.	Beaconsfield	Struck by cage in shaft	Joseph Goldsworthy	Ditto	Bruised foot	Attending to lift in main shaft: put his foot into cage compartment, and had it grazed by descending cage.
5 Mar.	Ditto	Ditto	Crushed by timber	Wm. Dobie	Single	Crushed hand	Was lifting cap-piece into position, and got his hand jammed between cap and leg.
18 Mar.	New Golden Gate	Mathinna	Fall down pass	Henry Wilson	Married	Fatal injuries	Was trucking mullock at No. 1 level and tipping it into main pass. Wilson, by some means, got into the pass, and was found lying dead on the mullock, 380 feet below. No evidence as to how he got into pass.
15 Mar.	Tasmania G.M.	Beaconsfield	Fall in stope	Frank Cook	Ditto	Injury to back	Was placing stope timber in position and lost his footing, slipping about 7 feet down the footwall and jarring his back.
		Mathinna	Explosion	Lewis Bear	Ditto		

							caused a twist of the intestines. Conlan died 30th April.
2 May	Tasmania G.M.	Beaconsfield	Caught in machinery in motion	Thos. Richard Miller	Ditto	Dislocated neck, &c.	Was oiling machinery in motion and became caught in it.
11 May	Ditto	Ditto	Fall in stopes	Wm. Grainger	Married	Bruised shoulder, &c.	Going down ladder into stopes; missed his footing and fell about 10 feet.
21 May	Briseis T.M.	Derby	Fall off truck	Wm. A. G. Underhill	Single	Severe shaking	Was hurrying out last truck from face. Truck left line and Underhill fell off.
2 June	Tasmania G.M.	Beaconsfield	Piece of stone flying from pick	James Goodman	Married	Injury to eye	Was working in stope, and a piece of stone flew back from the pick and struck him in the eye.
13 June	Ditto	Ditto	Tomahawk slipped	James Johnstone	Ditto	Joint off first finger left hand	Was putting a chock behind a lath, and took off top joint of first finger of left hand.
7 July	Anchor T.M.	Lottah	Machinery in motion	Hugh Parry	Single	Both legs broken below knees	Was about the machinery and got caught in one of the battery belts, being drawn under the pulley. Had no right near the machinery.
11 July	Ditto	Ditto	Struck by rolling stone	John Eager	Ditto	Left leg broken above ankle	Was working in open cut. A stone rolled from a higher bench and struck him on the leg.
14 July	Briseis T.M.	Derby	Fall from stage	Wm. Albert O'Connor	Ditto	Broken jaw	Was on nozzle-stage shifting nozzle and fell off.
21 July	Anchor T.M.	Lottah	Explosion of gelignite	Charles Berwick	Married	Injuries both eyes, cuts, bruises	Was charging a hole with gelignite, which was frozen and hard. In pushing the plug home with a wooden rammer an explosion took place. Doctor says sight of both eyes will be completely lost

LIST of Accidents in Inspector Griffin's District for the Year 1904—continued.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
23 July	Briseis T.M.	Derby	Fall from ladder	George Banks	Single	Bruised testicles	Coming down ladder about 4 feet high; slipped and fell on to peg in sluice-race.
29 July	Anchor T.M.	Lottah	Explosion of gelignite.	Thos. Imlach	Married	Injury to left temple and eye.	Was cleaning out a hole which, unknown to him, had a charge of gelignite in it, with a steel jumper. After the second blow an explosion occurred.
29 July	Briseis T.M.	Derby	Lifting truck on to road	William Isaac Arnold	Single	Jammed hand	Was lifting truck on to road and jammed his hand against a piece of cement.
30 July	Ditto	Ditto	Runaway wagon	Fred. C. Peck	Ditto	Bruised leg	Was driving a horse, and allowed empty wagon to run on to horse's heels. Peck was knocked down.
30 July	Ditto	Ditto	Fall against side of race	Louis Blulle	Ditto	Shock	Dismantling a race. Whilst drawing a tight nail fell back on to side of race.
3 Aug.	Tasmania G.M.	Beaconsfield	Fall of box of machinery	Henry Cotterell	Married	Bruised leg and small bone of ankle broken	Was assisting to move a case of machinery; the case slipped and jammed his leg against skids.
26 July	Ditto	Ditto	Piece of wire springing	David Macrostie	Ditto	Sight of right eye destroyed	Was fixing up a loose piece of wire in his sieve. The wire sprang back and hit him in the eye.
8 Aug.	Ditto	Ditto	Poisoned finger through a jam	James Willey	Single	Poisoned finger	Was fitting machinery and jammed his finger.
22 Aug.	Ditto	Ditto	Fall in shaft	John Goodman	Married	Broken rib	Was repairing shaft, and fell on his side across a lath.
25 Aug.	Briseis T.M.	Derby	Struck by pick	Cecil Russell Holland	Single	Wound on back of head	Was working at hopper with another man, who accidently

	Tasmania G.M.	field	chinery	roya			breaking small bone.
7 Sept.	Ditto	Ditto	Fall of clack-piece in pump-shaft	Wm. Grachan	Married	Bruised toes	Was working in main pump-shaft and dropped pump clack on his toes.
10 Sept.	Ditto	Ditto	Fell into ashpit	Geo. Pearson	Ditto	Broken rib	Ganger on night shift. Through not looking where he was going slipped and fell into an ashpit and broke a rib.
20 Sept.	Briseis T.M.	Derby	Slipped and fell	Richd. Thos. Beswick	Ditto	Small bone of arm broken	Was turning off a valve when he slipped and fell, bruising his arm and breaking small bone.
27 Sept.	Anchor T.M.	Lottah	Machinery slipping	H. Gough	Single	Fingers jammed	Was preparing to put a head on a shank which was hanging in sling-chains; shank slipped and jammed three of his fingers in the hole of the head.
8 Oct.	New Golden Gate	Mathinna	Fall of stone	Alexander J. Lang	Ditto	Injuries to chest	Was working in drive at No. 13 level when a fall of stone took place, and a portion of it struck him on the shoulders causing internal injury, from which he died a few minutes later.
8 Oct.	Ditto	Ditto	Ditto	William Fox	Married	Cuts and bruises head and body	Was working in No. 13 level with abovementioned man Lang, and was injured by the same fall of stone.
14 Oct.	Pioneer T.M.	Derby	Fall of earth	Henry Wilson	Ditto	Bruised arm	Standing on top of lump of cement, jumping hole into it. The lump broke in two. Wilson fell in between the two pieces, and portion of the cement rolled on to his arm.
14 Oct.	Tasmania G.M.	Beaconsfield	Fall in mullock pass	Edwd. Green	Single	Shock	When going down mullock pass slipped and fell, receiving a shaking.
21 Oct.	Briseis T.M.	Derby	Fall whilst carrying a pipe	James Mulville	Married	Broken rib, and severe pains in chest	Was helping to carry a pipe, and in doing so slipped and fell, receiving a blow on the chest.

LIST of Accidents in Inspector Griffin's District for the Year 1904—continued.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
7 Dec.	Anchor T.M.	Lottah	Run over by truck	Oliver Miller	Married	Fractured leg-bone and bruises	Was horse-driving on tram from tunnel to battery. He states that an empty truck ran off the line; whilst he was endeavouring to get it back again the horse started, and truck wheel passed over his leg.
8 Dec.	Briseis T.M.	Derby	Fall of rock	Francis Jos. Robinson	Single	Fractured skull and broken leg	Was loading stone into truck at a face about 25 feet high. A part of the lower portion of the face came away unexpectedly, and a large stone from it caught Robinson's leg and broke it. The force threw him down, and his head struck a stone with such force as to fracture the base of the skull.
3 Dec.	Briseis T.M	Ditto	Rolling stone	Wm. Jeffrey	Married	Bruised shin	Erecting barricade to keep hopperings from rolling into face, and was struck on shin by a piece of rolling basalt.
7 Dec.	New Golden Gate	Mathinna	Fall of stone	Joseph Street	Ditto	Cut head and slight fracture of skull	Was trucking at 800-ft. level, and whilst trucking a small stone came down a chute which he was passing and struck him on the head.

Mr. **Inspector Harrison** (stationed at Zeehan) reports:—

In submitting my annual report, I beg to state that the accident list is as follows:—Fatal, 3; serious, 5; non-serious, 6.

Two men were killed instantaneously in the Hercules Mine, Mt. Read, while charging a number of holes bored in the face of No. 6 adit. Another met his death by falling down a winze in the Spray Mine. He was drowned in about 5 feet of water which was in the level at the time.

Ropes and Cages.

Ropes and cages are in good working order. In several instances the old ropes have been replaced by new ones.

Ventilation.

The ventilation of the various mines is good, and the managers find it to their interest to keep a good supply of fresh air for the workmen.

Magazines.

I have now 25 magazines on my list. So far, nothing has been done towards removing the two within the precincts of the town to the area set apart for them.

Legal Proceedings.

Only in one instance was it necessary to take action, and this was through the negligence of one of the gangers of the open cut, Mt. Lyell Mine. One ot the workmen lost the sight of one of his eyes. A verdict was obtained against the ganger.

There has been an increase in the output of mineral during the year, whilst the substantial increase in the price of metals has caused more attention to be given to the poorer lodes of the district. Extensive progressive work is being undertaken by the managers of the principal mines of the district; and I am confidently looking forward to a further increase in the output of minerals from this field for the coming year. Following is a short report on the various fields and principal mines:—

Zeehan Field.—Mt. Zeehan (Tas.) Mine.—This property is looking first-class throughout. The manager has prepared plans for new main shaft and powerful pumping plant on the Spray section; and this work, I understand, is to be taken in hand without any unnecessary delay.

Zeehan-Montana.—Manager busy sinking from the 600-feet level; present depth, 650 feet. Proposed to sink to 800 at No. 2 shaft. Plunger workings have been put in at the 200-feet level, and sinking started. It is intended to open out at 400 feet. The usual output is being kept up.

Zeehan-Western.—Manager has opened out at the 800-feet level. A few parties are kept breaking ore in the higher levels.

Zeehan-Queen.—The prospects of this mine have improved very much during the last quarter. Manager has now a good payable shoot of ore in Clarke's lode, consisting of galena and stannite.

Florence Mine is opening up very well. The result of last quarter's work is 188 tons of ore, yielding 13,530 ozs. silver and 97 tons lead; net value £1857. Concentrating mill has been started and is doing good work, and a good output can be expected.

Oonah.—Matters at this mine are rather quiet. The directors have parted with their dressing-mill to the Murchison Mine, at Mount Farrell.

Nubeena.—This mine is on tribute, and is being worked with very good results.

New Mt. Zeehan.—Several small parties are working on this lease on tribute.

Silver King.—On this property I regret to say there is hardly anything doing, only 45 tons of low-grade ore having been won for the last quarter.

Comstock District.—South Comstock Mine.—Several tribute parties at work on galena and zinc blende. Two of them are erecting small pumping plants. Their prospects are good.

Dundas District.—Comet Mine.—On tribute, giving employment to 40 men. Over £2000 worth of ore (net) has been won during last quarter. Mining is confined to the upper levels, where new ground is being opened up.

West Comet.—This mine is supplying the local smelters with low-grade fluxing ore at a profit.

Mt. Read and Ring River.—Hercules.—This mine is now turning out larger quantities of galena and zinc blende ores. The former goes to the local smelters, and the latter is exported. Output for the year—galena, 9420 tons; blende, 7625 tons; and gossan, 50 tons. A new plant has been erected for separating the galena from the blende; it is working very satisfactorily.

The Mt. Read Company is still driving a deep adit for the lodes.

The Ring River Company has taken out a few parcels of copper ore, which have been disposed of to the Mt. Lyell Company.

Fahl Ore Company is working on high-grade fahl-ore, which is disposed of to the Mt. Lyell Company.

There are a few parties working on the Curtin-Davis hill.

Mt. Farrell District.—North Farrell Mine is opening up very well indeed. Arrangements are being made for sinking a winze from the No. 4 adit

Murchison Mine.—The directors have purchased a dressing-mill, which is to be erected without delay. The mine is looking very well, and there is a large heap of milling ore ready for treatment.

Macintosh Mine.—A small party of tributors has taken this mine on tribute, and is now getting out a parcel of ore.

Heemskirk District.—Mayne's Tin Mining Company is still working with payable results.

Federation Mine.—Some new developments have taken place lately. A lode has been laid bare, the capping of which has given prospects up to 5 lbs. tin to the dish. The property is about to be floated in London.

Tasman River Mine is working on payable alluvial tin wash. Several small parties are at work on the small alluvial flats: all are getting tin.

Stanley River District.—This extensive tin-field is opening up very well. Fresh finds are being made in the hills every few days. The prospects of the field for both lode and alluvial tin are very bright. An outlet, either by road or tram, is badly required. The only means of communication at present is over 20 miles of pack-track, and an aerial cage over the Pieman River.

White River, Heazlewood, and Mt. Stewart.—At the Whyte River a few men are working on the tin-grounds.

Washington Bay Mine.—The owner of this mine is breaking high-grade galena ores, and is about to erect a small dressing-mill to treat the seconds.

Long Tunnel Mine.—A 5-mile tramway is under construction to connect this mine with the main road to Waratah. An agreement has been entered into between the directors and the Tasmanian Smelting Company for the supplying of 1000 tons of ore. Most of this is stacked on the surface, and there are large quantities of ore showing in the stopes.

Magnet Range.—Magnet Silver Mining Company.—Nearly 3000 tons of gossan ores, carrying about 31 ozs. silver and 11 per cent. lead per ton have been exported to Dapto and Cockle Creek during the last quarter. The main shaft is being sunk another lift. The new dressing-mill is about ready to start. Mine looking well.

Mt. Bischoff.—Mt. Bischoff Tin Mine is working away as usual, and employing a large number of men.

A few small companies are working in this district.

General.—There is a large number of prospectors out in several directions, including N.E. Dundas, where tributors have taken up the Renison Bell Mine; Mt. Heemskirk; and the Professor Range. Annexed is the list of accidents for the year.

LIST of Accidents in Inspector Harrison's District for the Year 1904.

Fatal, 3 ; non-fatal, 11 ; total 14.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1904. 19 Feb.	Zeehan-Montana	Zeehan	Fall of stone	James Grady	Married	Compound fracture of right leg	A large piece of rock came away from hanging wall of stope where he was working.
22 Feb.	Tas. Smelting Works	Ditto	Hot slag exploded	Thomas Hines	Ditto	Injuries to eyes	Was keeping slag clear at the Smelters when an explosion took place in the shoot, splashing some of the hot slag on to his eyes.
8 Mar.	Zeehan-Montana (No. 2)	Ditto	Fall of stone	Frank Combes	Ditto	Bruises	Portion of face of drive came away.
8 Mar.	Hercules G. and S.M.	Mt. Read	Piece of flying steel	John Harris	Single	Injury to eye	Spark from blacksmith's anvil.
18 April	Tas. Smelting Co.	Zeehan	Explosion of slag	Thomas William Hudson	Ditto	Injuries to eyes	Was engaged in turning the water on and off in the granulating shoot, and an explosion occurred.
25 June	Hercules G. and S.M.	Mt. Read	Explosion	Frederick Breheny	Ditto	Mutilation, causing instant death	Were charging a machine-bored hole when a premature explosion took place. Both men were found dead.
Ditto	Ditto	Ditto	Ditto	Bertie Ayton	Ditto	Ditto	
4 July	Mt. Bischoff T.M.	Waratah	Splash of molten metal	William Kenworthy	Ditto	Injuries to eyes	Was assisting moulder, and some of the molten metal flew and struck him on eyes.
29 Aug.	Oonah S.M.	Zeehan	Fall of rock	John Price	Married	Scalp wound	Was working in stope, and part of hanging-wall came away.

							enough; his leg was caught by cage, and broken.
12 Sept.	Silver Spray, Mt. Zeehan, Tasmania	Ditto	Fall down winze	Henry Thomas Carey	Single	Cut on head	Was engaged looking after steam pump. His body was found at bottom of winze, in about 4 feet of water; but no one knows how he got there.
22 Sept.	Zeehan-Montana	Ditto	Fall of stone in stope	Joseph Rushton	Married	Bruised shoulder, arm, and side	A piece of stone came from roof of stope as he was crawling under it.
1 Oct.	Ditto	Ditto	Fall of stone	John Lacey	Ditto	Bruised side	Was crawling into stope after shot, and a piece of stone came down on him.
9 Nov.	Zeehan-Western	Ditto	Lowering of cage in shaft	George Webb	Ditto	Cut head, and shock to nerves	Was engaged sinking in bottom of shaft. Cage was about 15 feet up from bottom, hanging. Driver started engine wrong way, and lowered cage on to Webb.

Mr. Inspector CURTAIN (stationed at Queenstown) reports:—

Casualties.—The first half of the period under review having belonged to Mr. Waller's term of office, I simply transcribe the minutes that were entered by him. The balance of the period being free from any fatal or grievously serious accident, can be most favourably compared with any other Australasian mining centre of equal magnitude. The death of the youth Arthur Tibballs, which took place in the concentrating mill of the Lyell Blocks Mine on the morning of the 29th of December, being by the medical testimony and subsequent finding of the coroner's jury ascribed to natural causes, is for that reason omitted. Apart from this, the list of accidents is as follows:—

Mount Lyell Mining and Railway Company, Limited.—

(1) Albert Cox, single, aged 23 years, powder-monkey, North Lyell Mine. A premature explosion of gunpowder caused injuries to head and body; followed by death within two hours.

(2) John Cauley, single, 42 years, navvy, Mt. Lyell open-cut mine. Fell from one bench to another while arranging tramline. Collarbone broken and disjointed hip; has resumed work.

(3) Frederick Occleshaw, married, aged 40 years, head foreman bricklayer. Electrocuted at the reduction works, in consequence of coming in contact with uninsulated electric metals.

(4) Henry Lee, married, aged 40 years, head foreman ganger at the Mount Lyell open-cut mine, was charging a hole with rackarock, when it prematurely exploded, causing burns to his hands and face. He is again on duty.

(5) William Coady, 39 years, ganger Mount Lyell open-cut mine, lost his eyesight by an explosion through stooping over a charged hole of powder, into which a lighted primer had been dropped for the purpose of "bulling" it.

(6) J. Quinn, single, aged 22 years, miner, North Lyell Mine, was struck on the stomach by a stone coming away from an unprotected back; internal injuries resulted. On becoming convalescent he left for Victoria.

(7) Peter Petersen, single, aged 40 years, navvy at the Mt. Lyell open-cut mine, lost an eye by driving a gad into a drill-hole that contained a charge of lithofracteur. He is convalescent.

(8) John Robinson, married, aged 34 years, aerial filler at the Mt. Lyell Mines bins, had both bones of his right leg broken above the ankle by an empty truck that was being shunted for repairs being bumped off the travelling way, and falling on him. He is still incapacitated, though out of the hospital.

(9) William Anderson, single, aged 26 years, miner, North Lyell Mine, had his eye injured by a chock which he was driving home springing back (rebounding), and causing the injury. He is again at work.

(10) Richard Holmes, married, aged 28 years, navvy at the Mt. Lyell open-cuts mine, had his second toe broken, also his great and third toes and portion of instep on right foot jammed by a piece of dislodged pyrites rolling over on them. He is still confined to his home.

(11) Dennis Dowling, married, aged 55 years, labourer, while engaged emptying ore-trucks at the reduction works, fell into an ore-bin. After a week's attention at the hospital he left, well towards recovery, for Hobart.

(12) Charles Creed, widower, aged 50 years, was engaged filling limestone at the No. 2 plant, when some stone came down the bin in which he was working, and struck him on the shin and jammed his thumb. The thumb had to be amputated.

(13) John William Miley, married, aged 25 years, engine-driver, was cleaning one of the engine columns, when his foot slipped from the bed-plate, and was struck and crushed by the crank. He is back again at his work.

(14) Robert Gray, single, aged 23, was engaged on a drilling machine, at the 400-feet level, main stope, when a piece of stone dislodged by a workman near him struck him in the eye and caused its loss.

Lyell Blocks Copper Corporation.—(1) William King, married, aged 46 years, shift boss, was assisting in erecting timber on the top of the underground bin-floor, when stepping on a floor-slab that had, unknown to him, been displaced, he was precipitated into the ore-bin, and broke his right leg, in addition to receiving a severe shaking. He is again at work.

(2) Denis Nugent, single, aged 29 years, was engaged feeding a puddling machine, and while endeavouring to free its overflow was knocked into the trough by one of the revolving arms. He instantly regained his feet, and throwing himself out, saved his life. Beyond a severe shock he received no other injuries, and resumed work within a week.

(3) John Eddy, single, aged 23 years, miner, was injured in E. 1 section of the "office" tunnel stopes, about the legs and right thigh, by a fall of clay from the roof. This was chiefly attributable to Eddy and his mate withdrawing all the back laths for the purpose of putting in a hole, with the result that the ground (clay) being "winded" came away. He is at work again.

Crown Lyell Copper Mining Company, No Liability,—John Tyquin, single, age unknown, was engaged sinking the shaft, and in coming to the flat, fell off the chain-ladder. He received a severe shaking, but was able to leave the State.

Ropes and Cages.—Those in use, in addition to my own trials, have, especially in the case of the Mt. Lyell mines, received frequent tests by the owners, and when not up to the locally-recognised standard, were replaced or submitted (as regards the latter heading) to repair and overhaul. The ropes in general use for all classes of transit throughout this district are in good order and condition. "Miller's" Tasmanian cage predominates, and were a hand-lever, with appliances similar to that of "Cowling's—without the adjusting spiral spring—added, so that in case of necessity the cage could be stopped by anyone travelling in it, its efficiency would be improved. All surface tests with these cages invariably prove satisfactory; but it is questionable whether, if they were tried at greater depths, or in the event of a fall (tail) of the rope remaining over the pulley, or of an enginedriver losing control of the drum, the results would be equally satisfactory.

Shafts and Ladder-ways.—Owing to the corrosion occasioned by acid mine water, it is found necessary, in timbering, to adopt a "lock-joint" or "dove-tailed system," in order to do away as much as possible with any class of support or resistance that may require metal fastenings. The rungs in the ladders of the North Lyell Mine are being replaced with well-turned seasoned hardwood, as the latter possesses greater safety than the ordinary iron rounds, which are constantly wasting away.

Ventilation.—This, in all the mines, ranges from adequate to excellent, the air throughout the North Lyell and Blocks main stopes being exceptionally pure and wholesome.

Open Cuts and Surface Workings.—These, in all instances, have been carried on with care, and operations having ceased on the South Tharsis, the management had this, and the western side of the North Lyell, securely fenced, to protect the travelling public.

Uncovered Shafts.—These are a menace for which the active leaseholders are but in rare instances responsible as I am aware of shafts having had the decking removed and thrown into them. At present there are a number of shafts open, but the properties are deserted, and belong to no one.

Skilled Labour.—The North Lyell and Blocks Mines are training a class of labour which, for the purpose in view, must eventually prove superior to any that may be imported; and for that reason it is a great mistake the men do not recognise the value of obtaining from their employers a certificate of service and merit, like any craftsman in other callings. At present the only possessors of these are young students from the neighbouring States; while the "bone and sinew" look upon such recommendations with indifference.

School of Mines and Mechanics' Club.—Both of these institutions have been in existence for some time, and, thanks to the liberality of Mr. Sticht and the Mount Lyell Company, satisfactory progress is being made in the most useful branches of mining and mechanics, which are taught and demonstrated by a staff of practical instructors and lecturers. Classes meet twice a week in the State schoolroom, while assaying and analytical chemistry are taught in the commodious laboratory of the Mount Lyell Company.

Inspections.—Inspections and duties pertaining thereto have been attended to, as follows:—Lyell Blocks, 25; North Mount Lyell Mine open cuts, 25; North Mount Lyell Mine, underground, 23; Iron Blow Mine, 18; Crown Lyell Mine, 16; Mount Lyell clay faces, 16; Mount Lyell flux quarries, 16; reduction works, 8; Comstock-Tasman Mine, 4; Tasman and Crown Lyell Extended Mine, 4; May's Mine, 4; Coronation Mine, 3; Lake Jukes Mine, 2; Lyell-Tharsis Mine, 2; magazines, 15; enquiries, 6; inquest, 1.

Prospective.—The year just entered promises to be a busy and prolific one, as in addition to extensive prospecting at the mines, several parties are being equipped for further exploration in the bush, whence reassuring reports are already to hand in reference to Jukes, Darwin, and the Lynchford districts.

LIST of Accidents in Inspector Curtain's District for the Year 1904.

Fatal, 2 ; non-fatal, 16 ; total, 18.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1904. 27 Jan.	Mt. Lyell M. and R.	Mt. Lyell	Explosion of powder	Albert Cox	Single	Injury to brain and body, causing death	Fired a powder blast, which exploded almost instantly, causing injuries from which he died about two hours afterwards.
2 Feb.	Ditto	Ditto	Fall off ore bench	John Cauley	Ditto	Collar bone broken, and hip joint put out	Was working at tram, heaving on a bar ; the bar slipped, and Cauley fell over on to next bench, about 40 feet.
27 Feb.	Ditto	Ditto	Touching uninsulated electric metals	Frederick Occleshaw	Married	Electric shock, causing instant death	Was opening the switch of the sampling works motor, and touched some bare metal parts.
18 April	Ditto	Ditto	Explosion of powder	William Coady	Single	Face burnt	Was stooping over a hole charged with powder, and into which a lighted primer had been dropped ; charge exploded.
23 June	Ditto	Ditto	Fall of stone	J. Quinn	Ditto	Internal injuries	Was working in stope, and stone came away from the face and struck him in the stomach.
2 July	Crown Lyell Copper Co.	Ditto	Fall in shaft	John Tyquin	—	Ditto	Was engaged in sinking shaft. In climbing chain ladder, slipped, and fell about 18 feet.
10 Mar.	Mt. Lyell M. and R.	Ditto	Explosion of racka-rock	Henry Lee	Married	Slight burns, hands and face	Was charging holes with racka rock, when a charge exploded prematurely.
6 July	Ditto	Ditto	Explosion of nitro-glycerine (lithofracture)	Peter Peterson	Single	Loss of one eye	Was working on No. 2 bench ; drove a gad into a hole in a stone. There was a charge of lithofracture in the hole, and an explosion took place.
15 Aug.	Mt. Lyell Blocks	Ditto	Fall through floor of	Wm. King	Married	Right leg broken	Was helping to placesome timber in the mine and fall through

							right he was knocked into the trough and dragged round.
1 Oct.	Ditto	Ditto	Fall of stone	John Eddy	Ditto	Cut on forehead, bruises legs and thighs	Was working in an adit when a portion of the face came away and struck him.
13 Oct.	Mt. Lyell M. and R.	Ditto	Aerial truck left track	John Robinson	Married	Right leg broken	Was engaged at mine-bins as filler to main aerial ropeway. A bucket got out of order, and in process of shunting from working track for repairs, it fell on Robinson's leg and broke it.
29 Nov.	Ditto	Ditto	Rolling of piece of ore	Rd. Holmes	Ditto	Bruised instep and broken toe	Was filling truck on No. 3 ore-bench when a piece of ore rolled for about a yard and caught his foot.
7 Dec.	Ditto	Ditto	Fall into ore-bin	Denis Dowling	Ditto	Bruises and shock	Was emptying ore-trucks, and in passing from one truck to another he fell into ore-bin.
5 Nov.	Ditto (N.)	Ditto	Flying piece of wood	Wm. Anderson	Single	Injuries to right eye	Erecting timbers in stope; driving in a chock, which sprang back and struck him in eye.
24 Dec.	Mt. Lyell M. and R. (Smelters)	Ditto	Falling stone	Chas. Creed	Widower	Crushed thumb	Was filling limestone to No. 2 plant when some stone came down the bin and jammed his thumb.
8 Dec.	Ditto	Ditto	Machinery in motion	John William Miley	Married	Crushed toes	Cleaning one of the columns of blowers engine his foot, which was on bed-plate, slipped under the crank, which struck it and crushed it against bed-plate.
25 Nov.	Mt. Lyell M. and R.	Ditto	Flying piece of stone	Robert Grey	Single	Loss of one eye	Was engaged on drilling machine. A piece of stone flew from adjacent works and struck him in the eye.

Mr. Registrar Donohue (stationed at Waratah) reports:—

I have the honour to submit my report on the mining industry in the Waratah Division for the year ending 31st December, 1904.

The Mount Bischoff Tin Mining Company.—During the whole of the year the Goldfields Diamond-drilling Company continued boring operations. Several holes were put down in different parts of the mount, the deepest being 1600 feet, and, I am given to understand, none of them proved very satisfactory. Other parts of the mine continue to look well, and the usual output of 106 tons of ore per month is easily maintained, with an average of 230 hands employed.

The *Waratah* and *Stanhope* alluvial claims have, during the year, sent away 12 tons of tin ore, with six hands employed.

At Badger Plains, the *Wombat* is now being worked on tribute with a hydraulic sluicing plant, and a fair amount of tin is being won.

The Bischoff-Taylor has for some time past had a number of men employed in cutting a water-race for a distance of three miles, to bring water on to its tin sections, which are situated about three miles north-east of Waratah. The race will be completed in a very short time; the company will then start sluicing operations.

Sections situated about three miles north of Waratah, and known as Weir's Bischoff Surprise, are about to be put into a strong company, to work the bed of the Waratah River and flats adjoining the old Phœnix.

The Magnet Silver Mining Company.—The output of ore has been steadily maintained at about 1000 tons per month. The grade has been good and uniform. The greatest part of ore has been sent to Dapto and Cockle Creek, N.S.W. The principal underground work has been the stoping out of the block of ground above No. 5 level. The sinking of the main underlay shaft was resumed towards the end of the year, and is now about 50 feet below No. 5 level. On the surface, the erection of a concentrating mill has been pushed ahead, and is now well advanced. Average number of men employed, 120.

The Godkin Mine, Whyte River, has been put under the management of Mr. T. H. Jones, and a good deal of prospecting work is being done in the old workings, and they have a good quantity of milling ore stacked at grass.

The Long Tunnel Syndicate (formerly Mount Stewart) has about 1000 tons of high-grade silver-lead ore stacked at grass, and is waiting the completion of a wooden tramway, which is being constructed by C. B. M. Fenton & Co., contractors, from the 14-mile Waratah-Corinna Road to the mine, a distance of about five miles. When the tram is completed, the syndicate will send about 60 tons of ore weekly to the Tasmanian Smelters, Zeehan. There has been an average of 30 hands employed during the past three months.

The Washington Hay, Whyte River.—During the year about 10 tons of first-class metal was sent from this mine to the Smelters at Zeehan, realising £22 per ton. There is about 100 tons of good milling ore stacked at grass.

On the whole, the district has improved during the past few years. There are more men employed on the different mines, and a good deal of prospecting is being done at and around Waratah.

NOTES ON SOME ADDITIONAL MINERALS RECENTLY DETERMINED, WITH NEW LOCALITIES FOR SPECIES KNOWN TO OCCUR IN TASMANIA.

By W. F. PETTERD.

THE present contribution to the mineralogy of this State is of somewhat unusual interest, inasmuch as it describes for the first time an apparently new compound, which, although of no commercial value, is of some scientific interest. It is in its way a humble congener of the more imposing crocoisite, for the occurrence of which, in such magnificent developments, this island has obtained a great repute among mineralogists in all parts of the world, but, like it, is simply of scientific importance.

The Lefroy meteorite, now mentioned for the first time, is, although of such remarkably small size, worthy of special note, and its detection in the prospector's dish adds another to the romantic discoveries of such objects from unknown space. The already long list of the different minerals recorded from time to time as being found in this State is still further augmented by the addition of no less than eighteen not heretofore published; respecting these concise notes are given. Several of these are of some scientific interest, and two or three would be of industrial importance if they could be discovered in sufficient quantity. Notes on additional localities for a few others which are already on record are given, with some remarks on peculiar features presented by some few others.

I have to record my obligation to Mr. J. D. Millen, A.S.T.C., M.S.C.I., Lond., metallurgical chemist, for so generously undertaking the analysis of Bellite and Hercynite, for without this work, especially difficult as regards the first mentioned, my task would have lost its most important features.

1 BARRANDITE.—(*Hydrous aluminium and iron phosphate.*)

Occurs as brown dull amorphous masses of small size, associated with vivianite, Lyndhurst, North-East Coast.

2 BELLITE.—(*Chromo-arsenate of lead.*)

This extremely interesting and, it may be said, attractive new substance usually occurs in delicate tufts aggregated together, and velvet-like coated surfaces thickly lining and clustering in drusy cavities in somewhat soft iron-manganese gossan. The coated surfaces are often met with of reasonable size, and have been obtained covering several square inches of the gossan, more especially where vughs and fractures occur. More rarely bunches of galena are wholly or partially covered by the substance. It is often in crypto-crystalline incrustations, occasionally pulverulent, and more rarely in bunches of hexagonal crystals of almost microscopic dimensions. The largest crystals so far observed were but three millimeters in length, but the outline was sharp and very distinct. The crystals are of adamantine lustre, and a remarkably bright red to crimson colour. Minute acicular patches of crystals are common, and under the lens are perfectly distinct, and thus afford very fine microscopic objects of considerable attractiveness. The bright crimson colour of the general mass is very characteristic, and by this feature it is noticeable by the most casual observer, even when not directly interested in mineralogy. It sometimes occurs in aggregates of extremely minute needles, much like velvet, of a distinct and bright yellow to orange colour, and in this form it also occasionally coats somewhat large surfaces. Chromiferous cerussite and more rarely crocoisite and mimetite are intimately associated with it. Although so noticeable, the coating of the substance is usually of such extreme thinness that it was only with the greatest difficulty and by using the utmost care that enough was secured to make a complete analysis. This was undertaken by Mr. J. D. Millen, A.S.T.C., M.S.C.I., Lond., metallurgical chemist to the Mt. Bischoff T. M. Co. The following is the result:—

$Pb\ O$ = 61·680 per cent.
$Cr\ O_3$ = 22·611 „
$V_2\ O_5$ = 0·106 „
$P_2\ O_5$ = 0·045 „
$As_2\ O_3$ = 0·017 „
$Al_2\ O_3$ = 0·012 „
Cl = 0·516 „
So_3 = 0·054 „
Ag = trace
$Si\ O_2$ = 7·587 „

99·159

Moisture not determined. The hardness is 2·5; specific gravity approximately 5·5. Streak, pale yellow. Crystallographic system hexagonal. Before the blowpipe on coal it readily affords a bead of metallic lead with arsenical coating and odour. Imparts to salt of phosphorus bead in OF and RF a fine green, thus absolutely masking the reaction of $V_2 O_5$ in the OF with this reagent. In the wet the reaction of $V_2 O_5$ was only obtained with difficulty, following the method of Ohly (analysis of the rare metals). The powered substance was mixed with sodium carbonate, then fused, and after the addition of potassium nitrate lixiviated with water, filtered, and the clear solution boiled with ammonium carbonate. Acidified with hydrochloric acid, and hydrogen sulphide passed through the filtrate, the precipitate gave arsenic and green solution. The filtrate with concentrated ammonium of equal volume and treated with hydrogen sulphide gave a black precipitate which on filtering the solution left a cherry-red solution = vanadium. This new mineral species has been named in compliment to my old and respected friend, Mr. W. R. Bell, the veteran prospector, whose exertion has done much to advance the mining industry of this State, and who moreover has always taken a great interest in its mineralogy and geology.

Locality—The upper workings of the Magnet Silver Mine, Magnet.

3 **CLOANTHITE.**—(*Nickel diarsenide.*)

A greyish white isometric nickel ore, remarkable for readily altering or sweating on the surface, when specimens are in a moist atmosphere, to the hydrated arsenate, which on giving off its excess of hygroscopic moisture apparently becomes annabergite. It occurs in limited quantity with other nickel minerals in the lower levels of the Long Tunnel Mine, Rocky River.

4 **ENERGITE.**—(*Copper sulpharsenate.*)

Occurs in limited quantity with other ores of copper. North Lyell Mine, Mt. Lyell.

5 **EXCHERITE.**—(*Basic calcium aluminium and iron silicate.*)

This variety of epidote appears to be somewhat abundant on the margin of the Upper Emu River, opposite the north-west shoulder of Valentine's Peak. The crystals are at times quite half an inch in length, but are commonly broken and decomposed. Flakes of molybdenite sometimes occur disseminated in the masses of the substances.

6 GENTHITE.—(*Hydrous basic nickel and magnesium silicate.*)

Found sparingly on Pentlandite, near Trial Harbour.

7 GIBBSITE.—(*Aluminium hydrate.*)

Forms a thin seam on what is apparently the wall of a copper-bearing lode. Clarke and Sice's Copper Mine, Blythe River.

8 HELIOPHYLLITE.—(*Arsenate of lead with chlorine.*)

In small crusts lining druses with crystalline glimmering and wax-like surfaces. Comet Mine, Dundas.

9 HERCYNITE.—(*Iron aluminate.*)

Occurs as fairly large lumps in tin drift. It is amorphous, dull, of a bluish black colour and fine granular.

Analysis by Mr. J. D. Millen.

$Fe_2O_3 = 46{\cdot}91$
$CuO = 005$
$SiO_2 = {\cdot}0892$
$CaO = {\cdot}086$
$Cr_2O_3 = {\cdot}049$
$Al_2O_3 = 41{\cdot}69$

$99{\cdot}37$

Sp. gravity, 3·765. Hardness, 3·9. Locality Moorina. (J. Rundle.)

10 HYDROMANGANOCALCITE.—(*Hydrous carbonate of calcium and manganese.*)

Occurs as a soft pink substance which readily absorbs moisture, and is thus easily reduced to powder. Heazlewood Silver Mine, Whyte River.

11 IRON.—(*Lefroy meteorite.*)

A small meteoric siderite was obtained by a prospector in testing a dish of alluvial drift for gold in 1904. Its weight is 3·328 grains. Specific gravity, 7·847. It has the characteristic pittings and crust of such objects, and is beyond doubt of meteoric origin. Locality, Lefroy.

12 Leucophanite.—(*Silicate of calcium sodium glaucina with fluorine.*)

It would appear that this mineral, which has been hitherto overlooked, is fairly abundant at or in the vicinity of the Shepherd and Murphy Tin-Bismuth Mine, Bell Mount, Middlesex. It is closely associated with pyrite, both copper and iron, in the examples which have come into my hands. It crystallises in the orthorhombic system, with a constant hemihedral habit, and twinning is an occasional feature. The crystals are, as a rule, well-developed in clusters on the margin of a spheroid amorphous mass of the substance. They commonly average a centimetre in length, and are consequently recognised with extreme ease. The general mass presents a fairly uniform colour of a somewhat peculiar shade of olive green, with a vitreous lustre and glimmering reflection. The crystals are usually of a rather darker shade. A pronounced character of this mineral is that when heated it becomes highly phosphorescent with a distinct bright light, in which respect it resembles chlorophane. It is about 4 in hardness, with a white streak. To the petrologist this is a find of unusual interest, as the mineral is considered peculiar to the elœolite-syenites of Southern Norway, the classic locality for this remarkable series of rocks; and this has hitherto appeared to be its only recorded association. The indentification thus tends to show a wider distribution in this island of igneous rocks related to the varied complex so pronounced at Port Cygnet, and which have been fully described from time to time in the proceedings of this Society.

13 Manganite.—(*Hydrous manganese sesquioxide.*)

In small bunches of well-formed crystals. Hampshire Silver Mine, Hampshire Hills.

14 Minium.—(*Lead plumbate.*)

Obtained as small encrusting patches of the usual bright red colour in the superficial workings of the Long Tunnel Mine, Castray River.

15 NICCOLITE.—(*Nickel Arsenide.*)
This ore has been obtained in small quantity near Trial Harbour, West Coast.

16 PILOTITE.—(*Hydrated silicate of aluminium and manganese.*)
An altered variety of actinolite, known as "rock cork." It occurs in felted fibrous masses of a pale grey to almost white, in considerable quantity east of the "Red Face" at the Mt. Bischoff Tin Mine, Mt. Bischoff.

17 PLINTHITE.—(*Hydrous aluminium silicate.*)
An amorphous clay-like substance of a brown colour, with conchoidal fracture. Near Falmouth, East Coast.

18 PIMELITE.—(*Hydrated magnesium and nickel silicate.*)
As an incrustation attached to other nickel minerals. Near Trial Harbour, West Coast.

19 PROUSTITE.—(*Silver sulpharsenite.*)
At the Oonah Mine, Zeehan, this mineral, which is commonly known as "ruby silver," has been obtained in bunches of minute perfectly-formed rhombohedral crystals of remarkably bright red colour. They are implanted on cavernous masses of pyrites, and are readily detected by the contrast of colour. Under the low power of the microscope they form most attractive objects, the crystals being extremely sharp and distinct. They rarely exceed two to three millimetres in length. Minute crystals have also been noticed at the Magnet Mine.

20 PYRARGYRITE.—(*Silver sulphantimonite.*)
At the Magnet Silver Mine this mineral has recently been obtained in small but perfectly-formed characteristic rhombohedral crystals nestled in cavities in the lode gangue associated with galena and blende in the southern working of the mine. They are dull black in colour, due to tarnish, but readily give the bright red streak as well as the conchoidal fracture when broken. The mineral in its compact and investing forms is not by any means rare, but the crystals are extremely so; in fact they appear to be first detected in this state.

21 PYROSTILPINITE.—(*Silver sulphantimonite.*) A rare ore of silver (containing 59.44 per cent. of ag) known as "fire-blende." It crystallises in the monoclinic system and is sometimes tabular, but its common habit is in imperfectly terminated sheaves or irregular bunches—like stylbite—but of almost microscopic dimensions. It is of a hyacinth-red colour, but is generally tarnished to an almost black discolouration. When free from discolouration it has an adamantine lustre and decided red streak. In minute vughs it may be detected in association with nests of small quartz crystals. When coating cleavages in its extremely silicious gangue it soon arrests attention by its peculiar habit of occurrence in radiating and irregular bunches, by which feature it may be known from proustite, although both have the same bright colour. Before the blow-pipe it fuses easily, giving off white antimonial fumes, and with soda affords a bead of silver. It occurs in limited quantity, but quite enough to make an appreciable difference in the bulk silver assays. Locality, the Long Tunnel Mine, Heazlewood. Associated with this is another silver mineral of an orange yellow colour with yellow streak. It affects a frondose habit, and is found in exceedingly limited quantity as aggregates in the cleavages of the gangue. It may be xanthoconite (a silver sulpharsenate, crystallising in the rhombohedral system), but the quantity is too small to make reasonably certain of its exact identification.

22 QUARTZ.—(*Silicon dioxide.*) Mr. D. A. Porter, of Tamworth, N.S.W., has recently drawn my attention to an interesting occurrence of this mineral in a specimen associated with freibergite. Many of the extremely minute crystals attached thereto are "left handed" and others "right handed," and many of these show besides the "W" and "Y" trapezoids the rhombic face "S." This habit has not been detected in larger crystals from the same locality. The Hercules Mine, Mt. Read.

23 SCORODITE.—(*Hydrous ferric iron arsenate.*) This mineral was obtained by Mr. W. R. Bell in clusters of beautifully formed orthorhombic crystals of remarkably high lustre. They were of small size, pale green in colour, and almost translucent.

24 SICILIOPHITE.—(*Silicified serpentine.*)
This peculiar altered substance is extremely variable in colour, and occasionally almost opalescent. Near the Long Tunnel Mine, Castray River.

25 SMECTITE.—(*Hydrous basic aluminium silicate.*)
Obtained in patches of extreme softness almost gelatinous, but soon becomes somewhat harder. It has a metallic, almost silvery sheen. It separates into folice of extreme tenuity. North Lyell Mine, Mt. Lyell.

26 STEARGILLITE.—(*Hydrous basic aluminium silicate.*)
A pale yellow to almost white substance with strongly conchoidal fracture, and slightly opalescent and smooth surface. Derby.

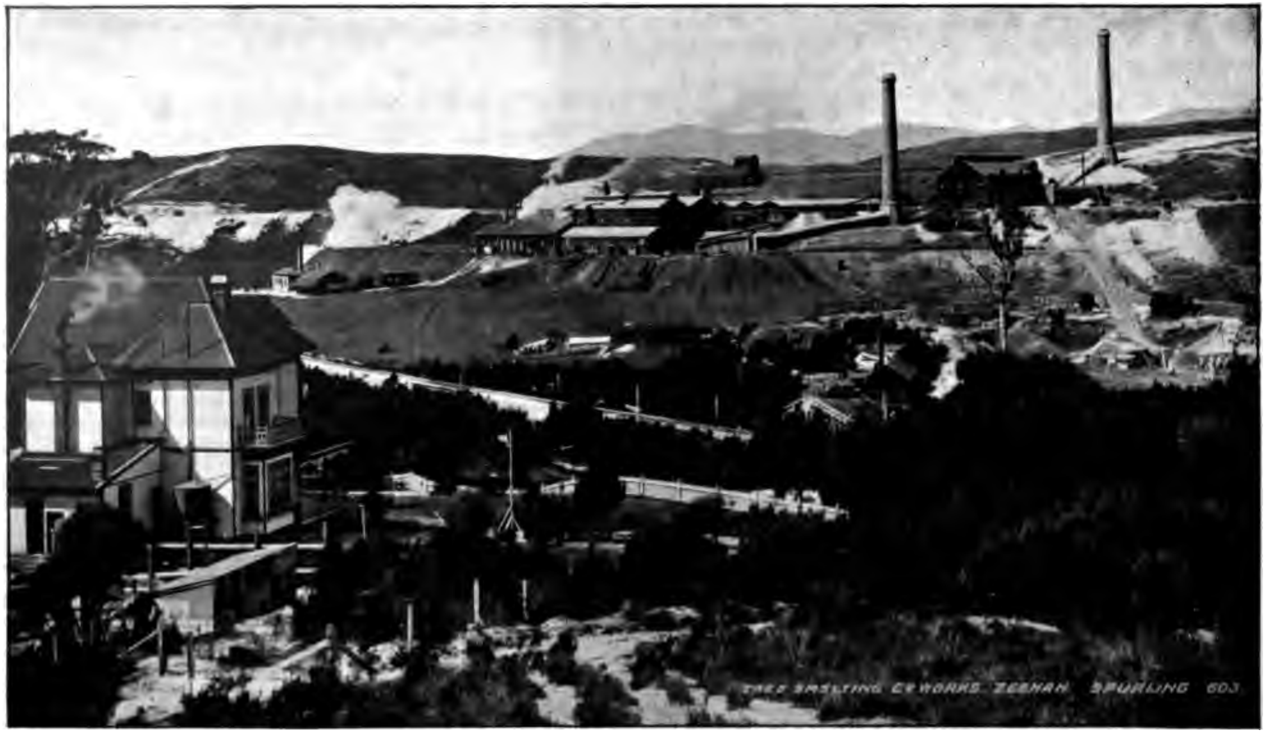
27 STEPHANITE.—(*Silver sulphantimonite.*)
Brittle silver ore. It is black and dull in general appearance, with a black streak. Found in thin irregular patches, implanted on a silicious gangue with "fire blende." Long Tunnel Mine, Castray River.

28 STIBICOLITE.—(*Hydrous antimony dioxide.*)
In limited quantity as a pale yellow pulverulent mass. British Zeehan Silver Lead Mine, Zeehan.

29 TOURMALINE.—(*Boron aluminium iron silicate.*)
The variety zeuxite, which is rich in iron and of an intensely dark green colour, occurs in remarkably large felted masses at the Castray River.

30 WURTZITE.—(*Hexagonal zinc sulphide.*)
A rare zinc mineral differing in crystallisation from sphalerite. It is hemimorphic in habit, and by that character it may be recognised when in crystals. Usually it occurs in columnar masses. Hercules Mine, Mt. Read, and Magnet Silver Mine, Magnet.

JOHN VAIL,
GOVERNMENT PRINTER, TASMANIA.



Tasmanian Smelting Company's Works, Zeehan.

TASMANIA

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REPORT

OF THE

SECRETARY FOR MINES

FOR

YEAR ENDING DECEMBER

1905

Including Reports of the Inspectors of Mines, Government
Geologist, Mount Cameron Water-Race
Board, &c.

Tasmania:
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1906

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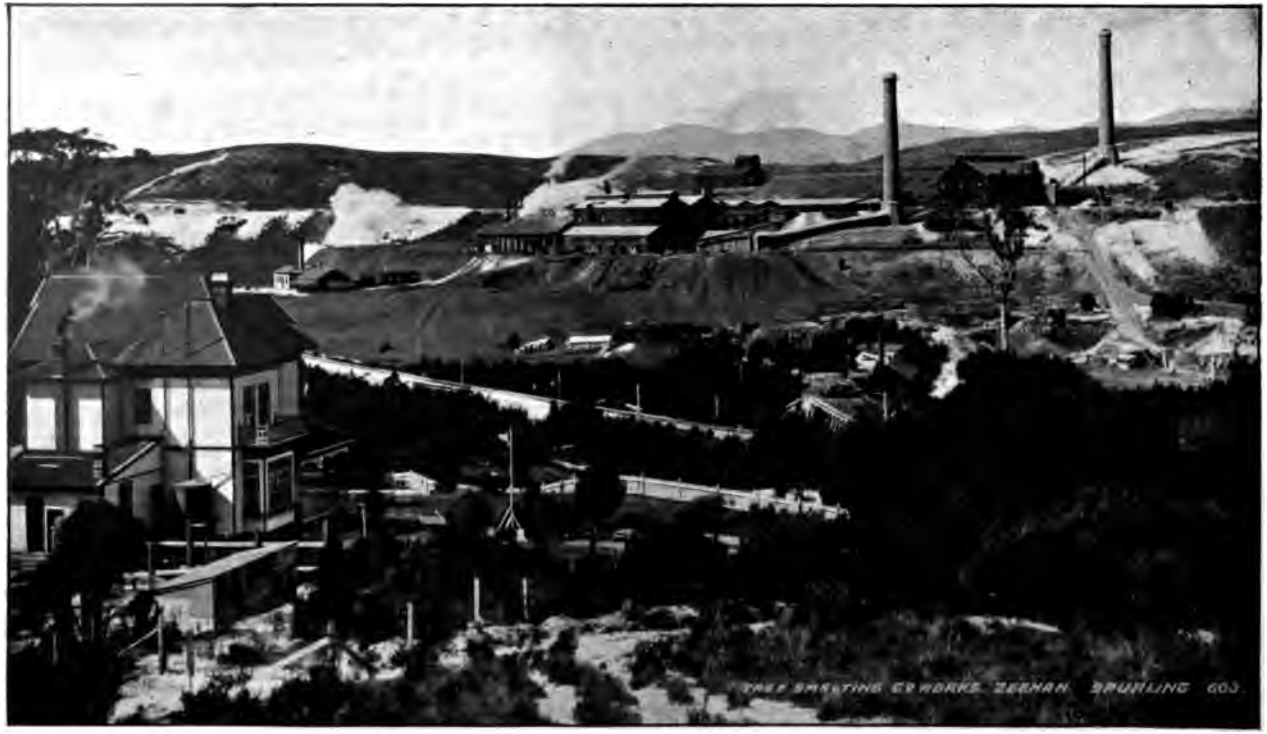

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REPORT OF THE SECRETARY FOR MINES.

Mines Department, Hobart,
27th August, 1906.

SIR,

I HAVE the honour to submit my Report upon the Mines Department, and the progress of the Mining Industry, for the year ending 31st December, 1905.

General Remarks.

The aggregate value of minerals and metals raised in 1905 was £1,729,129, being an increase of £317,937 upon the previous year. The steady rise in the market price of metals has given an impetus to the industry, and there has been an increase in the quantity, as well as the value, of the mineral raised.

The high price of tin has been an incentive to prospectors to search for that mineral, and in many instances new ground has been discovered and prospected with very encouraging results. In the North-Eastern district the tin-mining industry has rapidly advanced, and several dredges have been constructed for the purpose of working the tin-drifts in some of the low-lying flats which cannot be worked to advantage by any other method of mining.

A new Mining Act was passed during last Session of Parliament, which has many advantages over the previous Act, and will doubtless be found to contain many useful provisions which will be likely to foster and encourage the industry; but until the Act has been in operation some little time, and it has been given a fair working chance, it cannot be said whether all the new measures introduced will be found to give satisfaction.

In my Report for the year 1900-1 I suggested that a monetary reward should be offered by the Government to the discoverer of a new mineral field, such reward not to be paid until the field is on a sound basis, and has supported a stated population for a certain period. I am pleased to be able to state that the suggestion was adopted by the late Minister of Mines, and provision has been made in Part VII. of the new Mining Act for the payment of a reward, upon certain conditions, up to Ten thousand Pounds.

Appendices.

Appended will be found the following Reports:—

Annual Report of the Mount Cameron Water-race Board.
Report of the Government Geologist.
Report of the Chief Inspector of Mines.
Reports of the Inspectors of Mines.
Report of the Registrar of Mines, Waratah.

Gold Mining.

The production of gold for the year was 73,540½ ozs. of fine gold, being an increase of 7619½ ozs. on the previous year.

Beaconsfield.—The yield from this district was 36,450 ozs. of retorted gold, and the number of men employed was 800.

The opening up of the levels of the Tasmania Gold Mine proceeded very satisfactorily during the year, but the recent heavy rains caused the mine to be flooded in the deeper levels, and it will probably be some months before it can be unwatered. This company has since its commencement obtained 634,356 ozs. of gold, from 582,549 tons of quartz, and has distributed £772,671 15s. in dividends.

The only other mines working in this locality are the North Tasmania and the East Tasmania mines. The former is working in a small way, and the latter is about to put down a bore-hole to a depth of 2000 feet, in the hope of discovering the Tasmania reef.

Lefroy.—The discovery of a small nugget of gold last year again drew attention to this almost abandoned field, and led to surface and shallow prospecting being carried on for a time, but without any satisfactory results being obtained. The quantity of gold obtained from the field was 732½ ozs., of which the New Pinafore Company obtained 442 ozs., and the McIvor Company 97¾ ozs.

The average number of miners employed was 76.

Mount Victoria.—The New Ringarooma Company has taken over part of the Ringarooma Company's leases, and has obtained 240¾ ozs. of gold. The Long Struggle Syndicate and Krushka's Freehold obtained about 160 ozs. between them. Applications for permission to work the tailings from the Ringarooma Mine, under the new Act, have recently been refused, as the Act only applies to leases forfeited since the 1st January, 1906, the date when the Act came into operation.

Mathinna.—The premier gold mine of this field, the New Golden Gate Mine, which has contributed over 262,661 tons of quartz since its inception (yielding over 220,870 ozs. of gold, an average of 16 dwts. 20 grs. per ton, which has realised £840,275 19s. 3d.), and has distributed among the shareholders in dividends £355,200, or £11 2s. per share, has had a reverse of fortune. The gold-shoot appears to have thinned out in going down, and no permanent reef has been discovered, beyond a slide which cuts it off in the successive levels. A little gold was met with in the 1600-feet level, and a drive north started on the east reef; but the amount of gold obtained has been disappointing. Its neighbour, the Tasmania Consols Mine, has been fortunate enough to find a powerful payable reef, entering its property from the New Golden Gate section, and has been working it remuneratively at 1400 feet from the surface.

Several other mines in the vicinity are in the prospecting stage, but capital is required to properly and systematically develop them to prove whether gold exists in paying quantities, outside the two principal mines referred to.

Gold-mining on the West Coast has been confined principally to the Woody Hills and May Gold Mines, from which small quantities of gold have been obtained.

Silver Mining.

Zeehan.—The bulk of the silver-lead ore raised during the year has been obtained from the West Coast mines; the total quantity of ore raised being 75,270½ tons, valued at £246,888. The prospects of the West Coast fields are exceedingly good. The principal producing mines are the Mount Zeehan, Montana, Western Mines, and Florence Mines. Outside the Zeehan field the Dundas mines have maintained their productions, and have supplied large quantities of fluxing ores to the Zeehan smelters.

The Hercules Mine has been idle since the strike. The Rosebery Mine, to the north, is sending out large quantities of ore to the Zeehan Smelting Company's works. The company is able to treat the gold, silver, and lead contents successfully, and tributes let on the Primrose and Tasmanian Copper Mines have been worked very profitably in consequence. It is hoped that this field, which has so long remained dormant, will soon assume an important position among our mining centres.

Zeehan.

Mount Farrell.—The mines in the district are making steady progress. The North Farrell Mine has opened up for mining a large portion of its lode; and the Murchison River Company has completed the erection of its concentrating plant, and expects shortly to have its underground workings in a condition for handling its ore in an economical way. The Mackintosh Mine is being worked on tribute.

North-Western Division.—A very important development took place during the year in the No. 6 level of the Magnet Mine, the lode being struck 23 feet in width, consisting of about 5 feet of high-class ore and 18 feet of seconds. The lode has been driven on some 240 feet, and, although it continues towards the north, it is not so good as when first struck. The output of the mine has been continued, and the company is increasing its reserves steadily by pushing on the developmental work. The company proposes to bring in the Arthur River with the Magnet Creek, and, after use, to divert both streams into the Magnet bed, and then again into the Arthur River. A dam capable of holding 15,000,000 gallons of water, for use during the summer months, has been surveyed; and it is expected that electric power will be installed at the mine in place of the present compressed-air plant.

Heazlewood.—The Long Tunnel Mine has yielded a fair output of ore, but the work has had to be discontinued owing to the bad condition of the Waratah road.

Copper.

The output of copper and copper ore is valued at £757,226.

The Mount Lyell Mining and Railway Company's output has been steadily maintained. During the year the company smelted 426,854 tons of ore, producing 8610 tons of blister copper, which contained 8506 tons of copper, valued at £619,071; 732,019 ozs. of silver (fine), valued at £85,216; and 24,567 ozs. of gold (fine), valued at £104,027; a total of £808,314, as compared with £681,938 during the previous year.

The amount paid in dividends was £175,000.

The Lyell Blocks Mine is working its copper-bearing clay deposit, and producing regularly native copper concentrates.

The cupriferous schists on other claims at Lyell have been prospected to some extent, and it is rumoured persistently that several properties which had been temporarily idle are now about to resume work.

Blythe River.—The Copper King Mine has been taken over by an Adelaide syndicate, and exploratory and developmental work is being pushed on with.

Tin Mining.

The high market-price of tin which has ruled during the year has been the means of stimulating great activity in mining for this mineral, especially in the Eastern and North-Eastern districts, and large areas of land have been taken up, and are being prospected and developed with very encouraging results. The quantities raised in the various districts are as follow:—

	Tons	cwts.	qrs.
Northern and Southern Division	23	11	0
North-Eastern Division	1927	3	0
Eastern Division	524	16	0
North-Western Division	1316	3	0
Western Division	100	0	0
TOTAL	3891	13	0

The largest producer has been, as usual, the Mt. Bischoff Tin Mine, raising 1272 tons of ore; bringing the total production of this mine up to 64,774 tons 18 cwts.

2 qrs.; and dividends amounting to a gross total of £2,024,500 have been declared.

The next largest producers were the Briseis and New Brothers' Home No. 1 Companies, 882 tons 15 cwts.; the Pioneer Company, 309½ tons; the Anchor, 198 tons 14 cwts.; Mt. Rex, 95 tons 7 cwts.; Scotia, 24 tons 12 cwts.; Arba, 121 tons 17 cwts.; South Mt. Cameron Company, 62 tons 12 cwts.; Briseis Extended Company, 57 tons 13 cwts.

The Shepherd and Murphy Company's tin, bismuth, and wolfram mine, at Middlesex, which was idle for some considerable time, is now being prospected with English capital, and good results are expected.

At Gladstone great activity prevails, and the once almost deserted township is again flourishing. The established alluvial mines are producing their regular output, and a large area of new ground has been taken up and is being prospected, and in many instances with very encouraging results; and outside capital has been brought in for the purpose of constructing water-races and opening up and developing the mines.

The Gladstone Tin Development Company's dredge commenced operations in the Ringarooma River, and is now dredging at Bell's Flat, and obtaining tin.

Two dredges are to be built by the Dorset Bucket Dredging Company.

New ground has been taken up in the Pioneer, Moorina, Weldborough, Branxholm, and St. Helens districts.

The Swansea and Swan Tin Mining Companies have been formed for the purpose of testing the alluvial tin deposits on Schouten Main, and small parcels of ore have been sent away for smelting.

The tin deposits at Cox's Bight, in the south, which were abandoned some years ago, have been again taken up, and small quantities of tin are being obtained.

The Renison Bell Company's property, on the West Coast, which has remained idle for so long, has again started operations. The alluvial tin is being sent to market, and underground work is proceeding, with a view of testing the lodes.

At Mount Balfour and Stanley River several mines are at work, but are experiencing great difficulty in getting ore to market owing to the bad state of the roads.

Wolfram.

About 32 tons have been obtained, principally from the Ben Lomond mines and from the Middlesex district, an average of 13 men being employed.

Iron.

The only company raising and exporting ore during the year was the Tasmanian Iron Company, at the Penguin. Six thousand three hundred tons of ore were exported to New South Wales for use in smelting other ores.

Coal.

The quantity raised was 51,993 tons, as against 61,109 tons last year. The principal producers were:—

	Tons.
Mt. Nicholas Mine	24,802
Cornwall Mine	20,478
Mt. Cygnet Mine	2267
Catamaran Mine	1224

A few small mines in the Mersey district have suspended work.

The Sandfly Colliery Company has done a great deal of exploratory work, and has raised about 256 tons of coal. The company's operations have chiefly been confined to erecting a jetty at North-West Bay, and constructing a tramway from the jetty to the mine. This work has been completed since the close of the year, and it is expected that the mine will be a large contributor to the coal output of the State, as it is said the coal is of excellent quality for steam and household purposes, and should command a ready market.

Chinaware.

It is not generally known that the clays in several parts of Tasmania are well adapted for the manufacture of chinaware. Some time ago, Hon. E. Littleton sent a sample from the eastern shore at George's Bay, to the Copeland Pottery, Staffordshire, England, and the result is in every way satisfactory. The cups and saucers of the darker shade were made according to the same formula as the earthenware pottery, and the lighter-coloured samples after the manner of the white English china. The results are pronounced by experts to be remarkable, and prove the existence of valuable commercial clays on the East Coast of Tasmania.

The following Return shows the quantity and value of mineral products for the State of Tasmania during the year ending 31st December, 1905:—

Mineral.	Quantity.	Value.
		£
Gold	73,540½ ozs. (fine)	312,380
Copper & Copper Ore	1150¾ tons	52,939
Copper (Blister)	8610 ,,	704,287*
Silver-Lead Ore	75,270½ ,,	246,888
Tin & Tin Ore	3891½ ,,	362,670
Wolfram	32¼ ,,	2371
Coal	51,993 ,,	44,194
Iron Ore	6300 ,,	2600
Bismuth	3½ ,,	80
Total Value	...	£1,729,129

* Value of gold contents deducted.

Amount paid in dividends was £307,933.

Geological Branch.

During the year the Government Geologist has prepared reports upon the coal at Mt. Rex, and on the North-West Coast mineral deposits. He has also prepared quarterly reports on the mining industry of the State, and was also engaged examining the Mathinna Goldfield. The quarterly progress reports of the mineral industry have been issued, as usual. For these, as well as for the special district reports, there is a considerabe demand from abroad, and from visitors arriving in the State. Our publications lying upon the tables of public libraries and institutes throughout the world may be regarded as of distinct service in directing the attention of investors to the mineral resources of Tasmania.

Inspection of Mines.

The three Inspectors have satisfactorily discharged their duties in the districts severally allotted to them. Their reports are appended.

Mining Managers' Examination

The annual examination of candidates for mining managers' certificates was held in March. Two candidates only presented themselves for examination, and succeeded in obtaining sufficient marks to entitle them to receive second-class certificates.

Copies of the papers set at the examination are appended.

Diamond-drills.

The diamond-drills were not in operation during the period under review.

Mt. Cameron Water-race Board.

The report of the Board is appended.

Departmental Staff.

No changes in the Staff have been made during the year.

Revenue.

The net revenue for the year amounted to £20,208 17s., being an increase of £3577 8s. 10d. on the previous year. This amount does not include a sum of £5507 19s. 6d. deposited as survey fees with application for leases.

Conclusion.

The outlook for the present year is a favourable one. The registered value of minerals raised during the first six months of 1906 exceeds that for the corresponding six months of 1905 by £345,422.

Mining is very active all over the State on thoroughly legitimate lines, and the condition of the industry generally may, in the strictest sense of the word, be described as sound.

In conclusion, I desire to thank the officers of the Departmental Staff for the loyal and efficient manner in which they performed the duties allotted to them.

I have the honour to be,
Sir,
Your most obedient Servant,

W. H. WALLACE.
Secretary for Mines.

To the Hon. Alex. Hean, Minister for Mines.

DIAMOND-DRILLS.

Statement of ***Work done*** ***to* 31*st* December**, 1905.

Year.	Locality.	Direction of Bore.	No. of Bores.	Total Distance Bored.	Average cost per foot, inclusive of Labour and Fuel.		
	No. 1 Drill.			feet.	£	s.	d.
1882-3	Back Creek—For Gold	Vertical	7	1330	0	10	9
1883	Lefroy—For Gold	Ditto	4	1011	0	5	3
1884	Tarleton—For Coal	Ditto	1	401	0	5	6
1886	Longford—For Coal	Ditto	2	1585	0	4	0½
1886-7	Harefield Estate—For Coal	Ditto	1	725	0	6	5
1887	Cardiff Claim, Mount Malcolm—For Coal	Ditto	1	562	0	17	11¼
1888	Killymoon Estate—For Coal	Ditto	1	504	0	4	7¼
1888-9	Seymour—For Coal	Ditto	5	2266	0	7	8½
1889 } 1890 }	Beaconsfield (Phœnix G.M. Co.)—For Gold	Ditto	1	781	2	0	2
1890	Beaconsfield (East Tasmania G.M. Co.)—For Gold	Ditto	1	978	0	14	9½
1891	Spring Bay—For Coal	Ditto	4	937	0	6	10
1891	Ravensdale—For Coal	Ditto	1	114	0	11	1½
1891-2	Back River, Prosser's Plains—For Coal	Ditto	2	854	0	6	1¼
1892-3	Lefroy (Deep Lead Syndicate)—For Gold	Ditto	4	979	0	15	9
1893	Lefroy (East Pinafore Co.)—For Gold	Ditto	1	317	0	10	3
1895-6	Sandfly—For Coal	Ditto	4	2130	0	11	5
1898 } 1900 }	Blue Tier (Anchor Co.)—For Tin	Ditto	9	876½	0	9	1¼
1901-2	Llandaff—For Coal	Ditto	3	1944	0	7	4
1902	Recherche (Catamaran Co.)—For Coal	Ditto	2	956	0	9	3
1903	Ditto (Moss Glen Co.)—For Coal	Ditto	2	667	0	7	6
	Total	...	54	19,917½			

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XV

No. 2.

***RETURN showing the Quantity and Value of Gold obtained from Quartz during the Years* 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, *and* 1905.**

Year.	Quantity.	Value.
	ounces.	£
1880	34,345	130.622
1881	45,776	174 956
1882	36,215	137,183
1883	36,672	138,060
1884	30,540	114.630
1885	33,266	124.234
1886	25,004	87,516
1887	33,427	123,453
1888	34,156	126,139
1889	33,069	116,517
1890	17,829	64,184
1891	33,659	126.221
1892	34,386	128,947
1893	30,163	113,111
1894	52,239	195,396
1895	51,628	193,605
1896	59,453	222,948
1897	74,937	288,432
1898	72,080	283,422
1899	81,751	319,141
1900	79,977	311,580
1901	*68,779	292.155
1902	*70,440	299,212
1903	*58,868	250,054
1904	*65,159	276 779
1905	*73,032	310,219
	1,366,850	4,949,216

* Fine Gold.

Diagram showing Total Quantity & Value of Coal used in Tasmania during the years 1880-1905

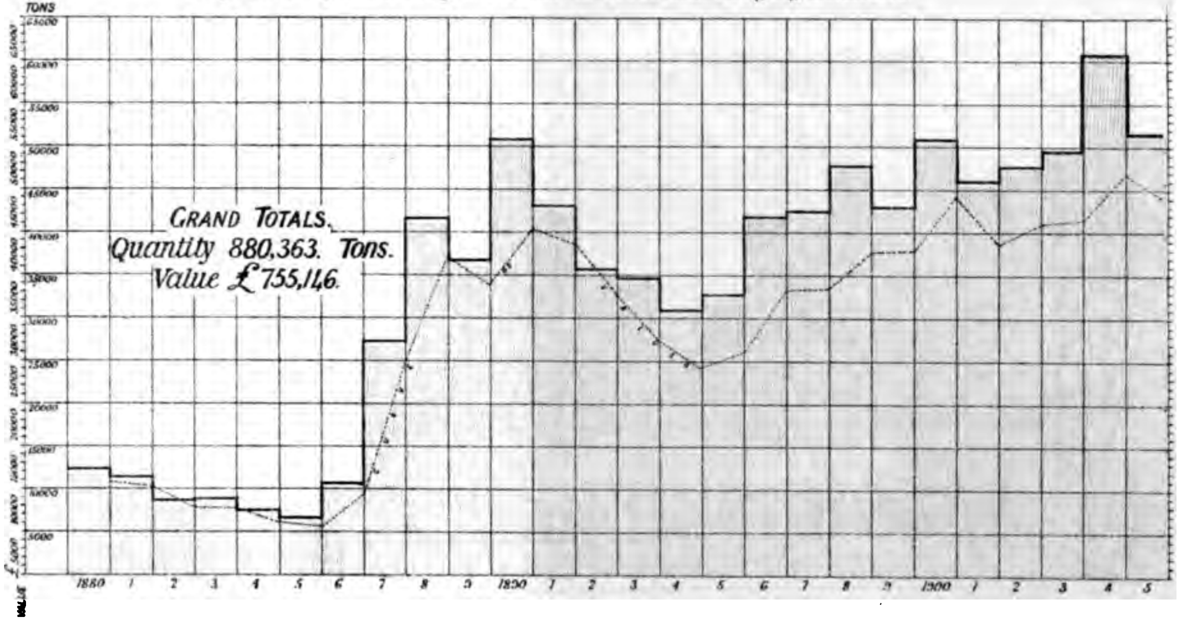


Photo-algraphed by John Vail Government Printer Hobart Tasmania.

Diagram showing Total Quantity & Value of Tin exported from Tasmania during the years 1880-1904 and Tin ore produced during the year 1905

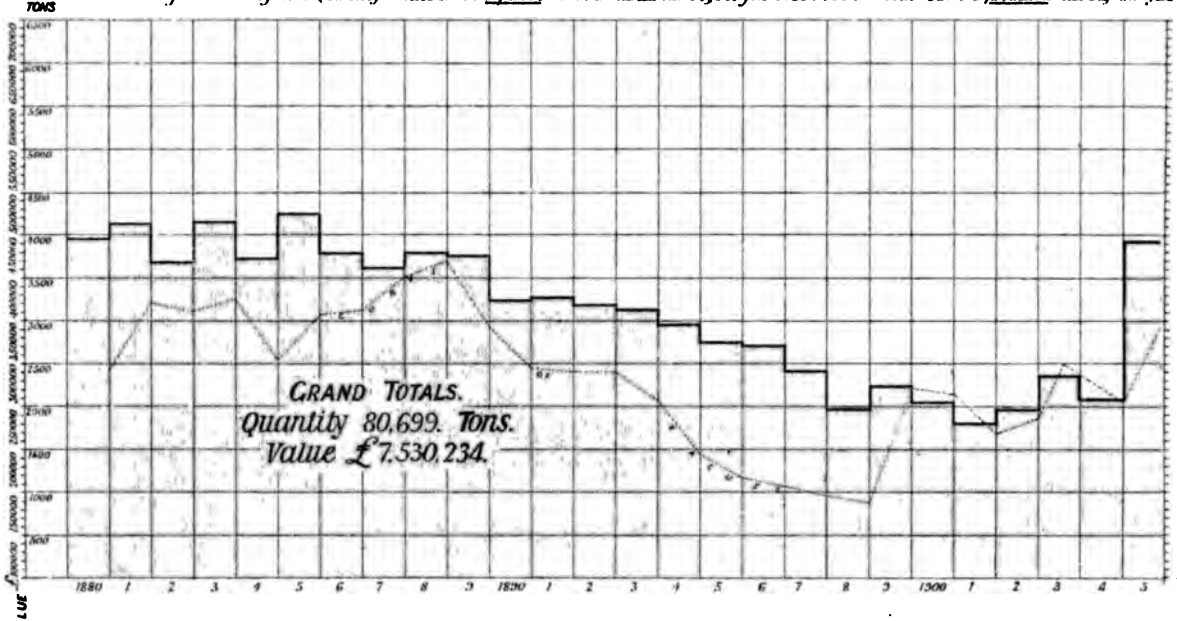


Photo-algraphed by John Vail Government Printer Hobart Tasmania

No. 4.

***RETURN** showing the Quantity and Value of Tin exported from Tasmania during the Years* 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, *and* 1904, *compiled from Customs Returns only, and Tin Ore produced during the year* 1905.

Year.	Quantity.	Value.
	Tons.	£
1880	3954	341,736
1881	4124	375,775
1882	3670	361,046
1883	4122	376,446
1884	3707	301,423
1885	4242	357,587
1886	3776	363,364
1887	3607½	409,853
1888	3775¼	426,321
1889	3764	344,941
1890	3209¼	296,368
1891	3235	291,715
1892	3174	290,083
1893	3128½	260,219
1894	2934	198,298
1895	2726¾	167,461
1896	2700	159,036
1897	2423½	149,994
1898	1972	142,046
1899	2239¼	278,323
1900	2029	269,833
1901	1789½	212,542
1902	1958¼	237,828
1903	2376$\frac{3}{20}$	300,098
1904	2171½	255,228
1905*	3891½	362,670
	80,699$\frac{18}{20}$	7,530,234

* Tin Ore produced : Customs having ceased to issue Returns.

No. 5.

RETURN showing the Quantity and Value of Silver Ore produced during the Years 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, *and* 1905.

Year.	Quantity.	Value.
	Tons.	£
1888	417	5838
1889	415	7044
1890	2053	26,487
1891	4810	52,284
1892	9326	45,502
1893	14,302	198,610
1894	21,064	293,043
1895	17,980	175,957
1896	21,167	229,660
1897	18,364	200,167
1898	15,320	188,892
1899	31,519½	250,331
1900	26,564	279,372
1901	28,774	207,228
1902	46,480	218,864
1903	42,422	192,492
1904	51,138	203,702
1905	75,270½	246,888
	427,386	3,022,361

No. 6.

***RETURN** showing the Quantity and Value of Blister Copper produced during the Years* 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, *and* 1905.

Year.	Quantity.	Value.
	Tons.	£
1896	41½	1245
1897	4700	322,500
1898	4955½	400,668
1899	8598	735,305
1900	9449	907,288
1901	9981	879,625
1902	7745	*462,151
1903	6684	*478,023
1904	8371	*582,540
1905	8610	*704,287
	69,135	5,473,632

* Value of Gold contained deducted.

No. 7.

***RETURN** showing Quantity and Value of Copper Matte exported during the Years* 1902, 1903, 1904 *and* 1905.

Year.	Quantity.	Value.
	Tons.	£
1902	2500	50,112
1903	3727	83,624
1904	—	—
1905	—	—
	6227	133,736

No. 8.

RETURN** showing the Quantity and Value of Copper Ore produced during the Years* **1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904,** ***and **1905.**

Year.	Quantity.	Value.
	Tons.	£
1896	34	1020
1897	75	2250
1898	394	8128
1899	1695	26,833
1900	4221½	63,589
1901	11,221	130,412
1902	5994	65,270
1903	102	790
1904	104	1640
1905	1150¾	52,939
	24,991¼	352,871

No. 9.

***RETURN** showing the Quantity and Value of Iron Ore produced during the Years* 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, *and* 1905.

Year.	Quantity.	Value.
	Tons.	£
1897	894	812
1898	1598	1598
1899	3577	3474
1900	5375	5995
1901	612	417
1902	2386	1075
1903	5980	2905
1904	6840	2975
1905	6300	2600
	33,582	21,851

Diagram showing the Annual Value of Minerals & Metals raised in Tasmania from 1880-1905

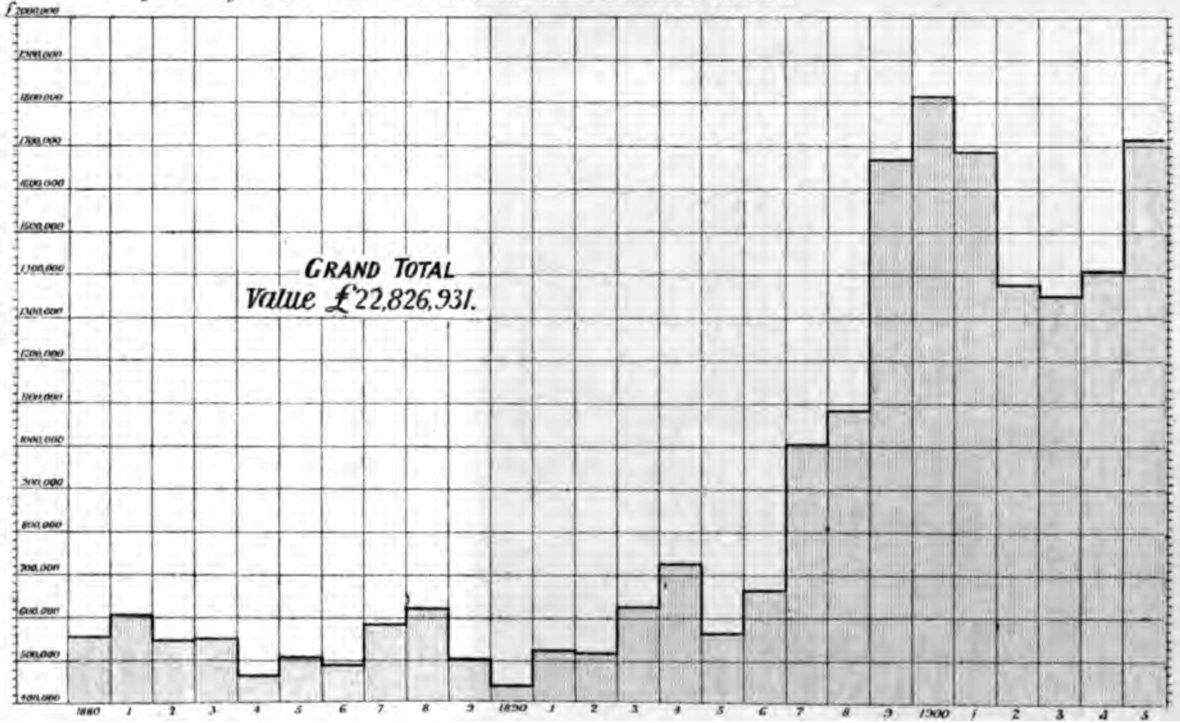


Photo-algraphed by John Vail Government Printer Hobart Tasmania

No. 10.

***RETURN** showing the Quantity and Value of Asbestos produced during the Years* 1899, 1900, 1901, 1902, 1903, 1904, *and* 1905.

Year.	Quantity.	Value.
	Tons.	£
1899	200	363
1900	128	113
1901	46½	45
1902	—	—
1903	—	—
1904	—	—
1905	—	—
	374½	521

No. 11.

***RETURN** showing the Quantity and Value of Wolfram produced during the Years* 1899, 1900, 1901, 1902, 1903, 1904, *and* 1905.

Year.	Quantity.	Value.
	Tons.	£
1899	3½	99
1900	53¾	2058
1901	—	—
1902	—	—
1903	—	—
1904	15½	1147
1905	32¼	2371
	105	5675

No. 12.

RETURN** showing the Quantity of Silver Lead and Copper Ore smelted for period* **25th June to* **31***st December*, **1896,** *and* **1***st January* **1897,** *to* **31***st December*, **1905.**

Year.	Ore Smelted.	Products.			Yield.			
		Silver Lead Bull'n.	Blister Copper.	Matte.	Copper.	Silver.	Gold.	Lead.
	Tons.	Tons.	Tons.	Tons.	Tons.	Ozs.	Ozs.	Tons.
1896	26,028 13/20	—	—	2417 6/20	1235 1/20	75,951	4707	—
1897	90,773½	—	3476 12/20	257 16/20	3583 14/20	334,349	16,485	—
1898	170,933	—	4992	—	4783	606,123	24,418	—
1899	275,239	2295	8463	89 6/20	8362	1,089,657	27,615	—
1900	363,113	4817	9449	—	9341	1,215,036	26,255	—
1901	355,528	1839	9982	50	9880	800,317	21,717	—
1902	411,736	6825	7727	2882	8841	1,674,816	24,719	6654
1903	399,032	7560	6683	3413	8094	1,855,158	25,238	7529
1904	433,366	—	8371	—	8265	1,896,134	26,809	7754
1905								

No. 13.

***RETURN** showing the Average Number of Persons engaged in Mining during the Years* **1880** *to* **1905** *inclusive.*

Year.	Number.	Year.	Number.
1880	1653	1893	3403
1881	3156	1894	3433
1882	4098	1895	4062
1883	3818	1896	4350
1884	2972	1897	4510
1885	2783	1898	6052
1886	2681	1899	6622
1887	3361	1900	7023
1888	2989	1901	6923
1889	3141	1902	5934
1890	2868	1903	6017
1891	3219	1904	6194
1892	3295	1905	6581

No. 14.

RETURN showing the Number and Area of Leases held under "The Mining Act, 1900," in force on 30th June in years 1899 to 1903 inclusive, and on 31st December, 1903, 1904, and 1905.

Nature of Lease.	In force on 30th June, 1899.		In force on 30th June, 1900.		In force on 30th June, 1901.		In force on 30th June, 1902.		In force on 30th June, 1903.		In force on 31st December, 1903.		In force on 31st December, 1904.		In force on 31st December, 1905.	
	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.	No.	Area.
		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.		Acres.
For Minerals, Silver, Tin, &c.	1207	64,339	1487	70,500	1388	60,865	1063	45,399	950	40,068	826	33,325	868	33,824	944	34,325
For Coal, Slate, Shale, &c.	39	6002	52	7258	55	7566	52	7819	66	10,767	54	9119	47	7546	45	7185
For Gold	652	6725	647	6623	566	6091	425	4166	310	3117	243	2505	222	2268	195	2087
Dredging Claims	—	—	—	—	—	—	—	—	—	—	15	124	29	469	51	1196
Mining Easements	—	—	—	—	—	—	—	—	—	—	34	225	39	234	45	282
Water Rights Mineral and Gold	200	933 sluice-heads.	225	1004 sluice-heads.	267	1318 sluice-heads.	300	1691 sluice-heads.	299	1514 sluice-heads.	281	1460 sluice-heads.	346	1495 sluice-heads.	251	1477 sluice-heads.

No. 15.

COMPARATIVE Statement of Revenue from Mines, being Rents, Fees, &c. (exclusive of Survey Fees), paid to the Treasury for the Years ending 30th June, from 1880 *to* 1903, *and for Six months ending* 31*st December*, 1903, *and for the Years ending* 31*st December*, 1904, *and* 31*st December*, 1905.

Year.	Amount.			Year.	Amount.		
	£	s.	d.		£	s.	d.
1880	8944	5	11	1894	16,732	7	7
1881	20,936	5	5	1895	15,323	1	9
1882	23,077	1	9	1896	20,901	13	2
1883	15,439	14	5	1897	25,631	0	3
1884	6981	11	10	1898	33,661	13	9
1885	11,070	5	7	1899	24,696	10	5
1886	12,523	10	4	1900	28,380	11	10
1887	14,611	11	5	1901	21,569	5	2
1888	23,502	8	4	1902	19,471	0	1
1889	17,254	9	0	1903	17,776	14	3
1890	26,955	4	9	1903, 1 July to 31 Dec.	14,758	17	1
1891	37,829	16	5	1904, Jan. to. Dec.	16,631	8	2
1892	17,568	18	4	1905	20,208	17	0
1893	16,971	9	2				

The above Statement does not include Stamp Duties upon Transfer of Leases and Registration of Companies, or the Tax payable upon Dividends, from which sources large sums are derived.

No. 16.

RETURN showing the Total Number and Area of Leases in force on 31st December, 1905.

Minerals.	Number.	Area.
		Acres.
Gold	195	2087
Minerals	109	6199
Silver	158	8157
Copper	37	1857
Tin	611	16,774
Coal	32	5142
Limestone	5	386
Iron	11	529
Slate	1	200
Wolfram	8	387
Asbestos	3	162
Precious Stones	1	80
Lithographic Stone	1	97
Marble	1	317
Shale	4	1040
Phosphate of Lime	1	3
Nickel	6	180
Machinery Sites	19	74
Dredging Claims	51	1196
Mining Easements	45	282
Water Rights	251	1477 sluice-heads, & 710 acres dams

No. 17.

RETURN showing the Average Number of Miners employed during the Year ending 31st December, 1905.

	Europeans.	Chinese.
Northern and Southern Division	920	1
North-Eastern Division	555	100
Eastern-Division	729	61
North-Western Division	432	...
Western Division	3783	...
	6419	162

No. 18.

RETURN showing the Mining Companies registered during the Year ending 31*st December*, 1905.

Number of Companies.	Capital.
14	£29,436

In addition to the above, 30 Agents for Foreign Companies, and 4 Syndicates, under 60 Vict. No. 51, were registered.

No. 19.

TOTAL Area of Land and Number of Sluice-heads of water applied for during the Year ending 31*st December*, 1905.

Mineral.	No. of Applications.	No. of Sluice-heads.	Area.
			Acres.
Bismuth	3	...	120
Coal	7	...	990
Copper	20	...	1065
Galena	3	...	54
Gold	81	...	869
Iron	2	...	100
Mineral	81	...	4210
Osmiridium	1	...	20
Silver	24	...	1143
Tin	694	...	19,385
Wolfram	1	...	78
Machinery Sites	6	...	28
Dredging Claims	66	...	1473
Water Rights	211	1233	916
TOTAL	1200	1233	30,451

No. 20.

***RETURN** showing the total Amount of Rents, Fees, &c., received by the Mines Department during the Year ending* 31*st December,* 1905.

Head of Revenue.	Amount. £	s.	d.
Rent under "The Mining Act, 1900," for Gold and Minerals	18,404	13	5
Fees, ditto ditto	1804	3	7
Survey Fees	5507	19	6
Rent of Diamond-drills	—		
TOTAL	25,716	16	6

No. 21.

***RETURN** showing the Amounts paid in dividends by Mining Companies during the Year ending* 31*st December,* 1905.

Mines.	Dividends. £	s.	d.
Copper	195,000	0	0
Gold	1600	0	0
Tin	76,944	0	0
Silver	34,389	0	0
TOTAL	£307,933	0	0

REPORT OF THE MOUNT CAMERON WATER-RACE BOARD FOR THE YEAR ENDING 31st DECEMBER, 1905.

8th March, 1906.

Sir,

We have the honour to present the report of the Board for the year ending 31st December, 1905.

Water.—The quantity of water at present available is twenty-five sluice-heads, being an increase of seven heads over this time last year. Most of this increase is derived from the Old Chum Creek, which has been connected with the main race during the year; the rest has been secured by renewing the old fluming across the Old Chum Creek, thus saving the water which was formerly lost by leakage.

Flumings.—There are 24 flumings, 23 of which, by constant care bestowed upon them, have been kept from total collapse. Some bad breaks have occurred during the year, which have taken some time to repair, necessitating the turning off of the water and causing loss of revenue. No. 26 fluming over Old Chum Creek has been replaced by an iron flume.

All the flumings need prompt attention, and the Board respectfully requests the Government to provide at once the sum necessary for their entire replacement, and thus guard against the risk of total collapse, which is imminent if the work is left to the limited resources of the Board.

Syphons.—The number of breaks in the syphon pipes has been less than last year, owing to the constant attention paid to them; but none of the water which leaks from the pipes is now lost, but is stored in a small dam and sold to claimholders working at a lower level.

Works.—The Government having purchased from Mr. James Ogilvie his water-right on Old Chum Creek for the sum of £75, the Board has now connected the Old Chum Creek with the main race, at a cost of £564 17s. 8d., which will be covered in twelve months' time by the increased revenue from the sale of additional water brought in by this connecting race. The renewal of No. 26 flume has also been carried out, at a cost of £639 9s. 11d. The report of the Engineer on these works is appended.

The statistics for the year are as follows:—

Average per week of claims supplied, 9.

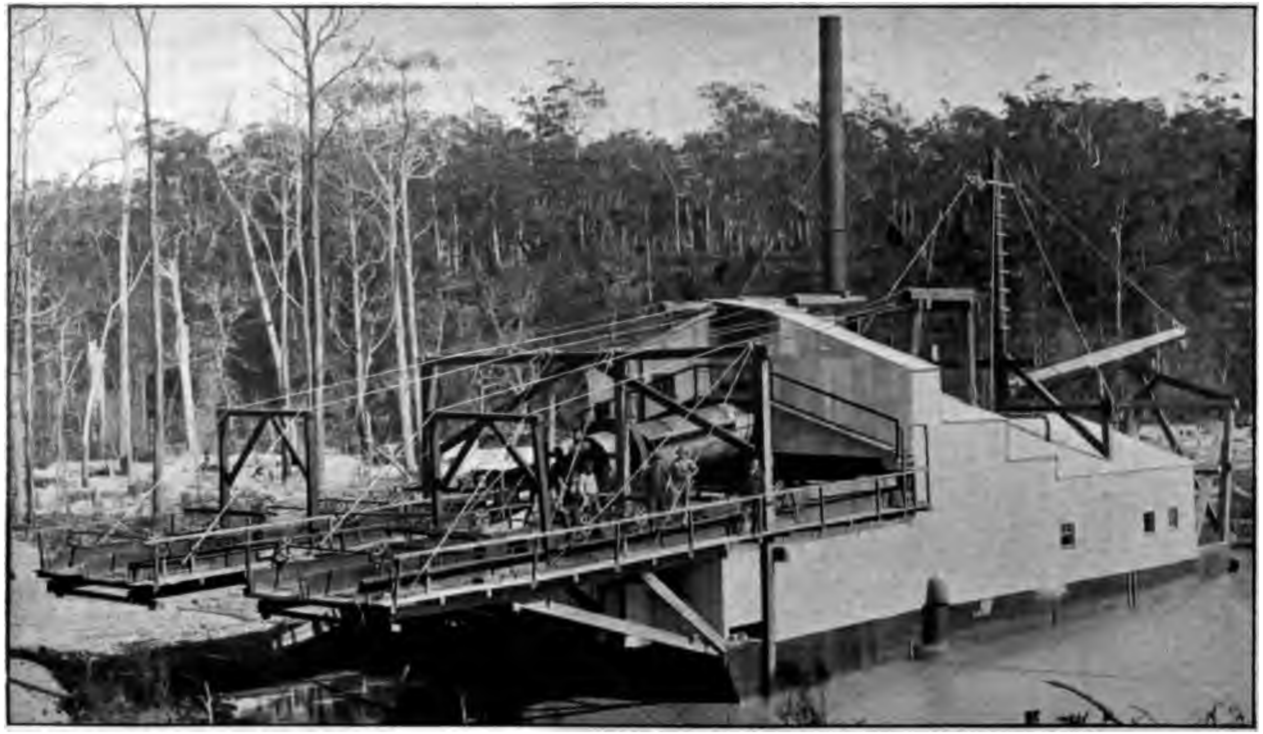
Greatest number supplied in any one week, 15.

Total number of heads supplied:—

Under fixed or cash scale	$4246\frac{5}{8}$
Under royalty or credit scale...	$78\frac{5}{6}$
Total	$4325\frac{11}{24}$

Tin ore raised:—Royalty scale, 17 cwts. 3 qrs. 19 lbs.; fixed scale, 74 tons, 15 cwts. 0 qrs. 24 lbs.; total 75 tons 13 cwts. 0 qr. 15 lbs.

Average number of miners employed:—Europeans, 28; Chinese, 1; total, 29.



Gladstone Tin Development Company's Dredge.

Total receipts for the year:—Fixed scale, £2553 4s. 7d.; royalty scale, £22 16s. 3d.; sale of wire rope, £5; total, £2581 0s. 10d.

Expenditure: Cost of maintenance and management—

	£	s.	d.
Salary and wages	582	8	0
Repairs to syphon-pipes	168	1	2
Repairs to flumings and race...	21	3	8
Cleaning race-channel	78	6	5
Travelling expenses...	55	12	5
Stationery and printing	4	8	0
Stores, tools, and general repairs ...	13	19	9
Insurance	3	6	0
Old Chum Creek—Connection and deviation of No. 26 flume	1204	7	7
Total	£2131	13	0

Paid to Public Debts Sinking Fund, 1905 (including moiety of rents of mineral land served by the race, £21 17s. 6d.), £978 13s. 6d.

Total amount paid to Public Debts Sinking Fund to 30th June, 1905, £9869 5s. 5d.

Total cost of purchase and construction, £34,281 19s. 0d.

W. H. Wallace, *Chairman of the Board.*
Edward L. Hall,
W. H. Twelvetrees,
John Simpson,
S. Hawkes, } *Members of the Board.*

The Hon. the Minister of Mines, Hobart.

ENGINEER'S REPORT.

Launceston, 16th January, 1906.

Sir,

I have the honour to forward to you my final report on the completion of the work of constructing the race connecting the Old Chum Creek with the Mount Cameron Water-race, and the deviation of No. 26 flume.

These works were commenced on the 24th May, and finished on the 31st October last, at a total cost of £1204 7s. 7d. Of this amount £564 17s. 8d. was expended on the Old Chum connection, and £639 9s. 11d. on the deviation of No. 26 flume. Crediting these works with the plant and material stored (at my valuation), the costs are:—Old Chum, £550 8s. 9½d.; and deviation, £575 0s. 0½d.

Old Chum Connection.—This work cost more than the estimate furnished for it, the reasons being insufficient information for the preparation of estimates, no alignment for race, bad weather, and indifferent labour.

The effects of these causes were as follows:—

Insufficient information.—It was considered desirable to complete as much of the work before the close of the financial year as possible, so that money might be utilised which would otherwise go into the general public revenue. There was not time to thoroughly test the ground by sinking trial-pits, to ascertain its nature, or to take cross-sections. As a consequence, there was a good deal more rock, cement, and drift than was expected, and it was impossible to make proper allowance for the slope of the ground.

The rock on the south side of creek at intake was considered to be sound at surface; but, when preparing to build the weir, I found that it was not so, and I had to take a lot of it out before I got a sound bottom. From the intake to the sluice-gate, where the random rubble wall was to be built, was a heavier work than was expected, as the bottom of the race came into running drift. This, of course, took more stone and cement for the wall; and for the race, the bottom had to be brought up to grade with rammed clay.

There was also a bad drifty bottom at the small creek which was picked up at 17-18 chains, necessitating going much deeper than was anticipated for sound bottom for the clay-hearted bank, and consequently requiring more clay to fill it up.

Alignment of Race.—As there was no time to do this before furnishing the estimate, the quantities were calculated from the line of contour. When the race was constructed, this line had to be departed from, so as to ease bends, and also to avoid weak spots. This meant always keeping on the high side of the contour, and consequently increasing the cutting. The slopes in some places were steep, and not nearly enough allowance was made for these in preparing the estimates.

Bad Weather.—At the start of the work there was about a week of very wet weather, which thoroughly soaked the ground, and brought the creeks up; and though there were considerable stretches of fine weather afterwards, any rain which fell ran from the soaked ground and flooded the works. As soon as the gullet was opened it used to fill with water, and the men were for weeks over their boot-tops in mud. It was not often practicable to cut an escape for the water, and then bailing had to be resorted to. Besides the discomfort of working in the mud, it was impossible for the men to shift as much material as if it were dry.

When working at the foundations for random rubble wall and clay-hearted bank, I had to keep two men on a Californian pump nearly all the time.

The creeks being high caused considerable trouble whilst putting in the concrete weir and clay-hearted bank.

Indifferent Labour.—This work was in progress when labour is generally scarce in the mining districts. Wet weather is the time when the tin mines are in full swing, and good and experienced pick-and-shovel men find no difficulty in getting employment of a more permanent nature, and in more convenient localities; consequently, I had not nearly such good labour as I might have had if the work had been done in the drier weather. Another reason for the excess of expenditure above the estimate is that the estimate given was for work only, and no provision was made for supervision, so that my salary and the wages of my chainman are altogether extras, as also was cost of plant and tents.

The clearing and felling was a heavier item than was expected. There were a good many large trees which Mr. Harvey and I considered endangered the safety of the race, and thought should come down; so I had them felled.

The random rubble wall, pitching and lining of intake, bank at 17-18 chains, and making up of faulty and weak places used up a lot of stone, some of which had to be carted over half a mile, at considerable expense, there not being nearly enough at hand. The bank also absorbed a lot of clay, the main part of which had to be carted; that which came out of the works was too wet to ram, besides being of indifferent quality, and there was not nearly enough of it.

Some of the rock at the lower end was very hard, and the heads did not run well for the race. When shot out the channel was very irregular and ragged, and I had to make a good portion up again. Through the whole of the shooting at the lower end precautions had to be taken to prevent flying stones from damaging the old flume. This, among other things, necessitated smaller shots than might often have been used with advantage, and different placing of shots. All these precautions necessarily added to the cost.

There was a great deal of hard cement and decomposed granite met with, much of which was too hard for the pick, and had to be got out with gads.

The cost of the rock-shooting was about 5s. per cubic yard, and of earthwork about 1s. 10½d. per cubic yard.

I had the work done in a thorough manner. I considered that a race, such as the Mount Cameron, which is required to serve a district, not only for the lives of the mines now working, but for any future developments, should be as sound as it could be made.

Deviation of No. 26 Flume.—The bulk of the first 5 chains of this is through fairly good cutting; but the slope is steep, and therefore the quantity of material to be removed was considerable. About 1 chain was, largely, hard red cement, and there was a nasty little gully to cross, which necessitated a clay-hearted double-stone wall about ¾ of a chain long and about 8 feet high at the deepest part. The stone for this wall had to be carted a considerable distance, none being procurable at the spot. The clay used was taken from the race.

From 9 chains 91 links to 6 chains 98 links is iron fluming on wooden trestle-work, and the remaining 3½ chains was stone-walling and rock-shooting. The flume was made of No. 14 gauge steel plates, fastened at either end. The flume trestling consists of five spans, the centre one crossing the Old Chum Creek, being about 36 feet in the clear, and trussed. The clearance of this centre-span above the ordinary creek level is about 10 feet.

The rock-shooting on this deviation was mainly through very hard rock, with heads running badly for the race; and being so close to the old flume, great care had to be taken to prevent flying pieces of stone from damaging that. These conditions, of course, added to the cost of the work; but the whole was carried through without causing any loss of water. The earthwork on this part of the work cost about 1s. 5¾d. per cubic yard, and the rock-shooting about 6s.

The flume is 45½ yards long, and cost approximately £290.

Yours obediently,

FRANK SNEYD GROVE,

Engineer in Charge of Works

W. H. Wallace, Esq.,
Chairman Mount Cameron Water-race Board,
Hobart.

MINE MANAGERS' EXAMINATION.

21st March, 1905.

Questions set.

Subject A.—Mining.

1. A mine has been worked to 400 feet deep. The flow of water during the past 12 months has averaged 17,000 gallons per hour. It is proposed to instal a new pump fit to work to 1500 feet deep—
   (*a*) What boiler H.P. is required?
   (*b*) What pump would you recommend?
   (*c*) How would you place that pump in the shaft?
2. State the Regulations under the Mining Act of the year 1900 which refer to winding from shafts, describing the different appliances you would use, and your reasons for preferring them to others used for the same purpose.
3. Describe the use of boring rods in Deep-Lead Mining.
4. Describe the system in which you would open up and stope a lode about 6 feet wide in—
   (*a*) Ground that requires no timber.
   (*b*) Ground with a rotten hanging-wall.
   Give in both cases details of timbering, &c.
5. A tunnel has to be driven 300 feet to connect with a shaft, how would you timber same and ensure ventilation?
6. What precautions would you take to ensure the health of the workmen in a mine employing—say 200 men?
7. State the various conditions to be considered in choosing a site for a shaft to work—
   (*a*) A nearly vertical quartz reef 5 feet wide to a depth of 1000 feet. Show position of shaft and crosscuts, and state generally the method of working you would adopt; or
   (*b*) A thin seam of hard coal, free from faults, and of considerable extent. Give size of shaft-pillars, and generally the method of working you would adopt.
8. Give working sketches, with all dimensions, of an opening set 12 feet high for a shaft 12 feet by 4 feet.
9. Explain, with sketches, the use of false sets and face-boards in a drive through drift. Give details of face-boards and sets.
10. Design an iron sinking-box for a 12 feet by 4 feet shaft through drift sand. Explain method of using it.
11. What do you understand by "Water Gauge," "Equivalent Orifice," "Upcast," "Downcast," "Brattice"? What is the advantage of splitting the air current? How would you calculate the power required to drive a fan to ventilate a mine?
12. Describe generally the "Tail-rope" and "Endless-rope" systems of haulage. How are branches worked by either method?

SUBJECT B.—ORE-DRESSING AND SAMPLING.

1. In deciding on the site for a battery or concentrating plant, what points have to be considered?
2. Describe in detail a concentrating plant that you are conversant with, and what samples you would take and how often.
3. How would you sample a 50-ton parcel of ore in bags, the value, according to sellers, about £22 per ton?
4. Give some principles of separation. What do you understand by "sizing" and "sorting" (hydraulic classification)? Give sketches of appliances suitable for performing each operation. Do you consider that there is any advantage in combining different principles? Give reasons.
5. Describe a Gates or similar rotary crusher.
   A hard ore breaks in large lumps. How would you arrange a plant of such crushers for a large stamp mill?
6. An ore with no free gold consists of equal proportions of pyrrhotite and quartz, and assays 25 dwts. to 30 dwts. How would you treat it?

SUBJECT C.—MINING GEOLOGY.

1. Explain the occurrence of artesian water.
2. Name some metamorphic rocks, and explain the phenomena of metamorphism.
3. Furnish a classification of ore-deposits based upon considerations of origin.
4. Give a descriptive account of how ore-deposits are altered and enriched.
5. Describe the modes of occurrence of (1) tin ore, or (2) gold, and mention the minerals which are characteristically found associated with them.
6. Describe fully the method of recovering a lode which has been heaved by a fault.
7. Distinguish between reef quartz and quartzite; between granite and syenite; and between diorite and basalt.
8. By what tests would you identify the following ores:—galena, cassiterite, chalcopyrite, telluride of gold?
9. Give an account of the more important laws and conditions which affect the occurrence of and richness of metalliferous veins.

SUBJECT D.—MINING SURVEYING.

1. The following traverse connects two shafts; calculate the bearing and distance from one shaft to the other:—

Bearing.	Distance.
N. 53° 30′ W.	254 feet.
N. 36° 15′ E.	236 ,,
S. 23° 58′ E.	201 ,,

2. Describe carefully the adjustments of the surveyor's level.
3. Shew a sample page of a field-book, giving levels along a proposed line of tramway, shewing at least 3 changes of the instrument and 2 intermediate readings from each position of the instrument. Assuming the reduced level of the starting-point to be 100·00, reduce all the levels and check the calculations.

4. Describe how to set out a race by means of a level and staff, the fall being assumed.
5. Two shafts are connected underground through drives, and a short winze of regular underlay. Describe how to connect these shafts by underground survey, and how to connect this underground survey with surface observations.
6. Describe the construction and principle of the aneroid barometer. In what kinds of surveys would you use this instrument? Indicate the method of taking observations and checking them.
7. A chute of pay ore in a quartz reef is found to be 300 feet long at a certain level, and its average horizontal width is 16 feet. At a level 200 feet lower the chute is found to be of the same length, and its average horizontal width to be 12 feet. Assuming that the angle of dip of the reef is 60° with the horizontal, and that the dip of the chute is the same as the dip of the reef, calculate the amount of ore between the levels.

SUBJECT E.—SURFACE WORK.

1. An inclined plane of 1 in 7 is 1400 yards long; what size steel-wire rope would be required to haul 30 tons of coal at an average speed of 4 miles per hour? Assume the other data.
2. What is the effective horse-power of a single-cylinder high-pressure steam-engine: cylinder 16 inches in diameter by 30 inches stroke; number of strokes 60 per minute; average steam pressure throughout the stroke 35 lbs. per square inch?
3. Explain fully the construction of any type of electric coal-cutter you may be familiar with.
4. An engine draws 10 trucks of coal of 10 cwts. each up an incline of 1 in 9, 100 yards long, at an average speed of 5 miles per hour. How many similar trucks will the same engine draw, at the same speed, on the level? Assume the other data.
5. A ventilating fan passes 84,000 cubic feet of air per minute, at a water gauge of 1·5 inches; what horse-power steam-engine would be required to drive it to do this work?
6. Describe the general arrangement of an aerial ropeway for conveying material. Give a brief description of—
   (*a*) Method of hanging buckets from rope.
   (*b*) Terminal station.
   (*c*) Trestles.
7. Give sketches showing all dimensions of a whim and brace for hauling from a shaft of about 100 feet depth, the maximum load of a full bucket being about 7 cwts.
8. Along the course of a proposed race the following country occurs:—Loose soil and decomposed rock, vertical cliffs, solid impervious rock without much side slope. Indicate briefly but clearly in what manner, and of what material, the race should be constructed in each case, and give sketches of cross-sections.
9. What will be the discharge in gallons per minute of a pipe 10 inches in diameter, the length of pipe being 3000 yards, and the head 40 feet?

10. Give specifications for magazine for storing all the explosives necessary for working a large mine. Assume the nature and amount of explosives.

SUBJECT F.—BOOK-KEEPING AND MINE ACCOUNTS.

1. Explain the difference between capital and revenue expenditure.
2. Give an account of the functions of a Cash-book, Journal, and Ledger respectively, and describe how they are kept.
3. If twelve men earn £109 10s. in equal shares, subject however to a deduction of a sum of £7 10s. 6d. for stores supplied to them, what will be each man's share of the balance remaining?
4. One cwt. of steel hammers costs £1 7s. 4d., and they weigh 7 lbs. each; what is the cost of each hammer?
5. Take 7½ per cent. from £5 18s. 6d. What remains?
6. Describe any method of preparing analyses of costs and summaries of output of labour for a mine of which you might be the manager.
7. If a cubic yard of ore weighs 5600 lbs., what is its specific gravity?

SUBJECT G.—MINING LAW.

1. What is the maximum quantity of gunpowder or other explosive which may be stored in any mine, and what distance should same be stored from any travelling road?
2. At what intervals are platforms required to be provided in ladderways for the descent or ascent of persons in a mine?
3. What quantity of detonators is allowed to be kept in any one level in a mine, and how should same be stored?
4. How often is a mine manager required to inspect ropes, safety appliances, &c.?
5. What constitutes a "Sluice-head" of water under the Mining Regulations?

COLLIERY MANAGERS' EXAMINATION.

24TH MARCH, 1905.

SUBJECT C.—MINING GEOLOGY.

[Subject " A.—Mining," on page xxxii., was also required to be answered.]

1. What is anthracite? How do you account for its formation?
2. Explain reverse and trough faults respectively.
3. What genera of fossil plants and animals are usually found associated with coal?
4. What reasons have been advanced for supposing that coal has accumulated by growth of vegetation *in sitû*?
5. Place the following geological periods in their proper sequence in descending order:—Silurian, Tertiary, Jurassic, Carboniferous (or Permo-Carboniferous).
6. Explain the following terms:—Bituminous coal, dyke, stratified rocks, columnar structure, metamorphism.
7. Describe the natural processes by which river deltas have been formed.
8. What are the characteristics of a good coal for gas-making purposes?

SUBJECT D.—MINING SURVEYING.

1. The following traverse connects two shafts. Calculate the bearing and distance from one shaft to the other:—

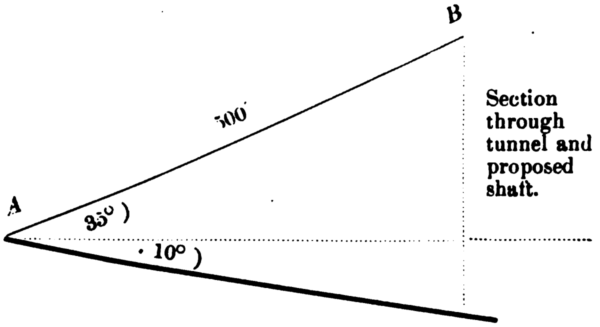
Bearing.	Distance.
N. 53° 30′ W.	254 feet.
N. 36° 15′ E.	236 ,,
S. 23° 58′ E.	201 ,,

2. Describe carefully the adjustments of the surveyor's level.
3. Show a sample page of a field-book giving levels along a proposed line of tramway, showing at least three changes of the instrument, and two intermediate readings from each position of the instrument. Assuming the reduced level of the starting-point to be 100·00 reduce all the levels and check the calculations.
4. Describe how to set out a race by means of a level and staff, the fall being assumed.
5. Two shafts are connected underground through drives and a short winze of regular underlay. Describe how to connect these shafts by underground survey, and how to connect this underground survey with surface observations.
6. Three bore holes have been put down, and each has cut a seam of coal. The distance apart of the bores is as follows:—

A to *B*	400 feet.
B to *C*	320 ,,
C to *A*	270 ,,

The thicknesses of the seam cut in *A*, *B*, and *C* respectively are 3 feet, 4 ft. 6 in., and 6 feet. Assuming the seam to be horizontal, calculate the amount of coal contained in the triangle formed by the bores.

7. A tunnel *A* has been driven on a coal seam which dips from the mouth of the tunnel at an angle of 10° with the horizontal. It is proposed to put down a vertical shaft from a point *B*, which is found by observation to be at an angle of elevation of 35° above the mouth of the tunnel, and at a distance of 500 feet from it, measured along the ground.



Section through tunnel and proposed shaft.

To what depth must the shaft be sunk to cut the seam?

Subject E.—Surface Work.

1. An inclined plane of 1 in 7 is 1400 yards long: what size steel wire rope would be required to haul 30 tons of coal at an average speed of 4 miles per hour?
   Assume the other data.
2. What is the effective horse-power of a single-cylinder high-pressure steam engine; cylinder, 16 inches diameter by 30 inches stroke; number of strokes, 60 per minute; average steam pressure throughout the stroke, 35 lbs. per square inch?
3. Explain fully the construction of any type of electric coal-cutter you may be familiar with.
4. An engine draws 10 trucks of coal, of 10 cwt. each. up an incline of 1 in 9, 100 yards long, at an average speed of 5 miles per hour. How many similar trucks will the same engine draw, at the same speed, on the level?
   Assume the other data.
5. A ventilating fan passes 84,000 cubic feet of air per minute, at a water gauge of 1·5 inches: what horse-power steam engine would be required to drive it to do this work?
6. Describe the general arrangement of an ærial ropeway for conveying material. Give a brief description of—
   (*a*) Method of hanging buckets from rope.
   (*b*) Terminal station.
   (*c*) Trestles.

7. Give the following details of a light tramway:—
    - (*a*) Weight and specification of rails.
    - (*b*) Size and number of sleepers.
    - (*c*) Method of crossing a watercourse, 12 feet wide and 10 feet deep.
8. It is required to excavate in clayey ground a tank to hold about half a million gallons of water. Describe some form of scoop which would expeditiously perform this work.
9. Describe a form of head-gear or pit-frame suitable for working a coal seam through a vertical shaft of moderate depth.
10. Give sketches of a form of travelling-belt for conveying coal from the pit to the sorters. Describe its use and method of working.

SUBJECT F.—BOOK-KEEPING AND MINE ACCOUNTS.

1. How many tons of coal are there in a lease of 320 acres, when the seam is 5 feet 6 inches thick, and the specific gravity of the coal is 1·30?
2. Name and describe the forms of accounts which a colliery manager would be required to furnish regularly to the office of his company.
3. Describe the functions of a Cash-book, Journal, and Ledger respectively, and explain how they are kept.
4. The yearly output of a colliery is 107,467 tons 13 cwts., but only 217 days are worked. What is the average output per day?
5. A colliery raises 12,165 tons 18 cwts. of large coal, and 2994 tons 2 cwts. of small coal. What is the percentage of small coal on the whole output?
6. Explain the difference between capital and revenue expenditure.
7. Divide £71 9s. 1¼d. equally between 37 men.

SUBJECT G.—MINING LAW.

1. What quantity of fresh air is required by the Mining Act to be provided in all underground workings for each man and boy employed therein?
2. How many men are required to be employed on a Prospecting Claim of 320 acres for coal, and for how long?
3. How many man-holes or places of refuge are required to be provided in a tunnel half a mile in length which is self-acting or is worked by an engine or windlass?
4. Before commencing to "hole" or undercut a coal seam, what is required to be done to render the same secure?
5. How would you proceed if you were required to mark off and apply for a coal section in heavily timbered or scrub country?

REPORT OF THE GOVERNMENT GEOLOGIST.

Government Geologist's Office,
Launceston, 31st December, 1905.

SIR,

I HAVE the honour to present my Report as Government Geologist for the year ending 31st December instant.

During the year I have prepared the following reports:—

1. On coal at Mt. Rex, 28th April, 1905.
2. On North-West Coast mineral deposits, 26th July, 1905.

The above examinations and reports occupied my time for the first seven months of the year; my field time in the remainder of the year has been spent on the Mathinna goldfield, the inspection of which has not yet been completed.

Mount Rex.

Some coal seams of Mesozoic age have been discovered in the Parish of Malvern, one of which is 12 feet in thickness, and of good quality. It is between 600 and 700 feet above the railway line; and the outlet for the coal would be down the valley of the Buffalo Brook to Hanleth, on the Avoca-Conara railway line. A tramway 7 miles will require to be constructed. The closing down of Mount Rex Tin Mine interrupted negotiations with diamond drill owners for the necessary boring to prove the extension of the seam.

This discovery has extended the Nicholas-Fingal coalfield considerably nearer to Conara, and tends to strengthen the possibility of coal measures existing still further west, and still nearer to the main trunk line of the State. Geologically, however, the coal is identical with that of the Mt. Nicholas group. What is really wanted is an improvement in quality, or a decrease in cost compared with existing collieries, so as to initiate an export trade, as the local demand for coal is not sufficient to keep our present coal mines in full work.

North-West Coast.

This journey included several important districts, viz.:—Rocky Cape, Boat Harbour, Wynyard, Stowport, Blythe, Sulphur Creek, Penguin, Dial Range, and Forth. These are separate fields, and required separate visits. In some cases my inspection of mining work begun by local people saved these from throwing away good money after bad; in other instances I was able to report favourably on the chances of further work. More especially was this the case at Stowport and Blythe, where copper ore lodes were being developed; and in the Dial Range district, where copper and silver ore deposits had for some time received attention from investors.

The Stowport-Blythe mineral field is one of promise. In my report I have stated that the mineral-bearing series of strata are there, and that there are undoubted evidences of lode action; and modest shipments of rich copper ore have been made.

Associated with these copper deposits is the Blythe-Rutherford line of hematite, which is destined in the future to be an important source of iron. Despite the apparently agricultural character of this part of the Coast, these deposits may be expected to absorb large amounts of capital invested by those interested in mining.

Penguin is another mixed agricultural and mineral field. The rich iron ore quarried on the Penguin Creek is shipped to New South Wales Smelting Works, to be used as flux in the furnaces. The quality is highly suitable for the manufacture of iron; and, in time to come, the deposit will be utilised for that purpose. It may not go down very deep, but the extent to which it can be followed underneath the basalt capping is unknown.

Other iron ore deposits occur in the form of transmuted conglomerate at the summit of the Dial Range. These are not quite so accessible, but no doubt will be worked in due time.

On the east side of the Dial Range is granitic mineral ground, which is being tested for silver and copper. A moderate amount of capital has been expended, and the discoveries are in course of development. It is too soon to expect results, as, in some cases, much deeper work is necessary; but the field is encouraging for prospecting, and I have pointed out in what direction such work should be attempted.

The beach deposits of silver-lead ore at Penguin are not being worked; and I think deeper mining is necessary in order to get below the meshed veins, which have yielded the ore hitherto, to where they possibly unite and form stronger lode-channels lower down. The variable assay returns are suggestive of much leaching having taken place, and it is highly probable that much richer ore will be found in depth.

Near Alma, between the Wilmot and the Forth, some lode action has taken place, which led to copper-mining a quarter of a century ago at the Barrington Mine. Results were not very promising, though a little ore was obtained, and later work has not disclosed anything of value. There is what appears to be a brecciated contact rock zone here, which may carry a mineral deposit, and the country is worth prospecting.

Mathinna Goldfield.

This has not been reported on for the last thirteen years. During this time a good deal of work has been carried out on the field. The New Golden Gate has sunk the deepest shaft in the State (1600 feet from surface). The Tasmanian Consols has deepened its shaft to 1400 feet, and outside capitalists are expected to initiate work in the district. It was felt that a fresh examination of the field would be useful. I am at present engaged in this, and Part I. of the report will be prepared first, and issued at an early date. The adjacent goldfield of Mangana will be examined as soon as Mathinna is finished.

Blue Tier.

In September, in conjunction with Inspector Griffin, I visited this district to inspect the dam-sites which the Government was about to allot to holders of tin ground on the Tier. The Mt. Lyell Company, having amalgamated with various leases, is preparing to test the ground by boring before launching into exploitation on a large scale.

Pottery Clay.

Consequent upon my report in 1904 upon the kaolinic clay near St. Helens, some experiments were made in England with this material, and a few manufactured articles have been received, showing that it is amenable to treatment.

Should the fine pottery industry be established here, these deposits will be of value, as the clay is of suitable quality, and the shipping facilities are excellent.

Progress Reports.

I have prepared during the year four quarterly reports on the mineral industry. I think it may be said that our statistics are comprehensive, and as exact as possible.

A new obligation is imposed by "The Mining Act, 1905," on mine owners and managers, to furnish regularly each quarter the statistics relating to their respective mines, and they are earnestly requested to supply these promptly. I shall always be thankful for any information respecting mining work which managers or owners may wish to communicate.

Office.

Two geological and four progress reports were issued in 1905. The correspondence consisted of 2200 letters, &c., in and out. The usual monographs and bulletins issued by the Survey and Mining Departments of various countries, and publications of scientific institutions, have been received and added to the office library. I beg to thankfully acknowledge receipt from the proprietors, of copies of the *Examiner*, *Daily Telegraph*, *Australian Standard*, *Mining and Engineering Journal*, *Mining and Scientific Press*, *Queensland Mining Journal*, and *New Zealand Mines Record* for office use.

A collection of rocks and ores, from Zeehan, was forwarded by request to Dr. Richard Beck, at Freiberg, the well-known writer on ore deposits. Another collection was sent by the commander of the Austrian warship, *Panther*, to the Imperial Museum, Vienna. A collection was also despatched to Prof. Hoefer, the distinguished Director of the Leoben School of Mines, Austria. Individual specimens have been supplied to Professors Rosenbusch, Brogger, Lacroix, and other authorities interested in the minerals of Tasmania.

Mr. F. S. Grove, as usual, has fulfilled the duties devolving upon him with credit and efficiency. During the year he was charged with the work of connecting the Old Chum Creek with the Mount Cameron Water-race, and of deviating the main race where it crossed the Old Chum Creek. This work was carried out in a highly satisfactory manner, and will result in increasing the water supply of the main race by 4 to 6 sluiceheads per 8 hours.

Government Drills.

These have not been used in 1905. Endeavours have been made to sell the alluvial boring plant, but so far a purchaser has not been found.

I have the honour to be,
Sir,
Your obedient Servant,
W. H. TWELVETREES, *Government Geologist.*

W. H. Wallace, *Esq.*, *Secretary for Mines, Hobart*

REPORT OF THE CHIEF INSPECTOR OF MINES.

Chief Inspector of Mines' Office,
Launceston, 31st December, 1906.

SIR,

I HAVE the honour to submit my Report on the inspection of mines for the year ending 31st December instant.

I beg to submit a diagram and tables of statistics covering accidents which have taken place at the mines during the year just ended, and to append the annual reports of Mr. M. J. Griffin, Inspector of Mines for the Northern and Southern, Eastern, and North-Eastern Divisions; of Mr. Jas. Harrison, Inspector of Mines for the Western and North-Western Divisions; and of Mr. C. H. Curtain, Inspector of Mines for the Lyell District.

The number of persons employed this year in the industry at mines and smelting works was 6586. Seven persons met with their death, and thirty others were seriously injured. The death rate from accidents was 1·06 per thousand, compared with 1·453 per thousand the previous year. The fatal accidents were distributed as follows:—Northern and Southern Division, 3; Western Division, 4. In the Western Division, 3 occurred in the Lyell District, and 1 at Zeehan.

There has been a gratifying decrease this year in the number of serious accidents. The previous year was an altogether exceptional one; and even neglecting the figures of that year, those of the year just closed may be looked upon as giving a low average. They would have been still lower had it not been for the exceptionally heavy work at the Tasmania Mine, which has involved risks out of the ordinary.

It was not found necessary to take legal proceedings in respect of any breaches of The Mining Act this year; nevertheless, the Inspectors have investigated all serious accidents, and have condemned ropes, cages, shafts, &c., where they have found these in an unsafe condition, besides insisting upon numerous underground workings being made safe for men to work in. Men, through constant exposure to the risks of their dangerous calling, become so careless, and employers, especially in the smaller and inadequately-financed mines, are often so negligent, that an onerous task devolves on the Inspectors, the benefits of whose ceaseless watchings and warnings are too often not sufficiently realised.

It gives me pleasure to commend the industry, judgment, and discretion with which our three Inspectors have discharged their duties. There is no doubt that the work of inspection will be greatly facilitated by many of the new provisions of The Mining Act, which comes into force on the 1st January, 1906.

Some of the most important of the changes which have been made in that part of the Act which relates to the working and inspection of mines are as follows:—Authorising the Inspectors of Mines to inspect smelting works, and bringing the latter under the operation of The Mining Act; general rules for such works; provision of two outlets for ingress or egress in the case of collieries; provisions for weighing coal, and regulations to come into force when check-weighers are appointed; compulsory certificates or permits for all colliery managers; daily inspection of coal mines for gas, &c.; provision for a proportion of jurymen on coroners' inquests to be miners wherever practicable; Inspectors authorised to order the use of safety-cages; to order, under the authority of the Minister, the connection of adjoining mines, where necessary, for ventilation and escape; regulations affecting ventilation and explosives; and sundry other amendments of the General Rules.

So many additions have been made to the old Act that it will take a little time for mine owners and mining managers to familiarise themselves with the new requirements, and the situation for the moment is sometimes difficult; but our Inspectors may be relied upon to act with the necessary discretion and firmness.

When the new Act is in working order, it will certainly be realised as making improved provision for the regulation of mines and the safety of miners.

I have the honour to be,
Sir,
Your obedient Servant,
W. H. TWELVETREES,
Chief Inspector of Mines.

W. H. WALLACE, *Esq.*, *Secretary for Mines, Hobart.*

TABLE showing the Number of Persons Killed and Injured in and about the Mines of Tasmania during the Year 1905.

PLACE OR CAUSE OF ACCIDENT.	INSPECTION DISTRICTS.													
	Northern and Southern Division.		North-Eastern Division.		Eastern Division.		North-Western Division.		Western Division.				TOTAL.	
									Zeehan and other Districts.		Lyell District.			
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
UNDERGROUND—														
Falls of Ground	...	3	...	...	...	...	...	...	1	1	1	1	2	5
Shaft Accidents—														
Suffocation by natural gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Overwinding	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	1	2	...	...	...	...	...	...	...	...	...	...	1	2
Falling in or into shafts.	1	2	...	...	...	...	...	...	...	...	...	...	1	2
Things falling into shafts	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Explosives	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	2	8	...	...	...	...	...	...	1	1	1	1	4	10

***Miscellaneous* (*underground*).**														
Explosives	1	1	...	...	...	...	...	...	...	3	...	...	1	4
Suffocation by natural gases	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Haulage—														
On inclined planes	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ropes or chains breaking	...	...	...	...	...	...	...	...	...	...	...	...	...	...
By trams and tubs	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sundries	...	1	...	...	...	...	...	...	...	...	...	1	...	2
Total	1	2	...	...	...	...	...	...	...	3	...	1	1	6
Total underground	3	10	...	...	...	...	...	...	1	4	1	2	5	16
ON SURFACE—														
Electrical	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Smelting Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery	...	...	...	...	...	1	...	...	...	1	...	...	...	2
Boiler explosions	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tramways	...	1	...	1	...	...	...	...	...	...	1	1	1	3
Explosives	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Falls of ground	...	...	...	...	...	1	...	...	...	...	1	...	1	1
Miscellaneous	...	2	...	2	...	1	...	...	...	...	...	2	...	7
Total on surface	...	3	...	3	...	3	...	...	...	1	2	4	2	14
GROSS TOTAL	3	13	...	3	...	3	...	...	1	5	3	6	7	30
Total during 1904	1	16	2	11	2	10	...	1	2	11	2	16	9	65

TABLE showing Rate per Thousand Killed and Injured in the different Mining Divisions for the Twelve months, 1st January, 1905, to 31st December, 1905.

Division.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total number Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
Northern and Southern	921·75	13	3	11	14	15·19	3·25	11·93
North-Western	432·5	—	—	—	—	—	—	—
North-Eastern	654·25	3	—	3	3	4·58	—	4·58
Eastern	795·5	5	—	5	5	6·28	—	6·28
Western	3782·5	13	4	11	15	3·97	1·06	2·91
Totals	6586·5	34	7	30	37	5·62	1·06	4·55

Analysis of Statistics for the Western Division.

Division.	Average number of men employed.	Number of Accidents.	Number of Persons.		Total Killed & Injured.	Average per 1000 Killed and Injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
Mount Lyell	2325·75	8	3	6	9	3·87	1·29	2·58
Zeehan, &c.	1456·75	5	1	5	6	4·11	0·68	3·43
Totals	3782·5	13	4	11	15	3·97	1·06	2·91

Diagram showing the ratio of fatal accidents in mines in Tasmania
Rate per 1000 men employed

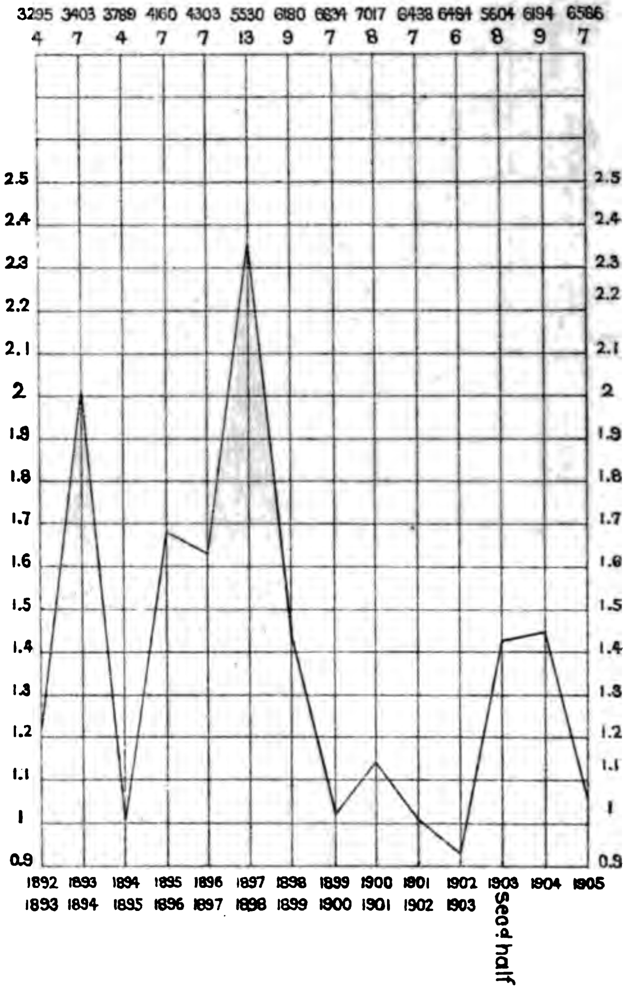


Photo-algraphed by John Vail Government Printer Hobart Tasmania

COMPARATIVE Table of Statistics of Accidents in and about the Mines of Tasmania from 1st July, 1892, to 31st December, 1905.

Period.	Number of Miners employed.	Number of Accidents.	Number of Persons.		Total killed and injured.	Average per 1000 killed and injured.	Average per 1000.	
			Killed.	Injured.			Killed.	Injured.
1 July, 1892, to 30 June, 1893	3295	28	4	25	29	8·8001	1·214	7·586
,, 1893 ,, 1894	3403	25	7	20	27	7·934	2·057	5·877
,, 1894 ,, 1895	3789	26	4	24	28	7·390	1·058	6·332
,, 1895 ,, 1896	4160	22	7	16	23	5·529	1·682	3·847
,, 1896 ,, 1897	4303	36	7	31	38	8·831	1·627	7·204
,, 1897 ,, 1898	5530	36	13	33	46	8·318	2·351	5·967
,, 1898 ,, 1899	6180	35	9	34	43	6·957	1·456	5·501
,, 1899 ,, 1900	6834	19	7	16	23	3·365	1·024	2·341
,, 1900 ,, 1901	7017	29	8	23	31	4·417	1·140	3·278
,, 1901 ,, 1902	6438	38	7	35	42	6·524	1·088	5·437
,, 1902 ,, 1903	6484	44	6	43	49	7·557	0·925	6·632
,, 1903, to 31 Dec., 1903	5604	27	8	20	28	4·977	1·428	3·569
1 Jan., 1904, to 31 Dec., 1904	6192	73	9	65	74	11·951	1·454	10·497
,, 1905 ,, 1905	6586	34	7	30	37	5·618	1·063	4·555

REPORTS OF INSPECTORS OF MINES.

Mr. Inspector Griffin (stationed at Launceston) reports:—

I have the honour to present my report of mines inspected in the Divisions under my charge, viz., Northern and Southern, North-Eastern and Eastern, for the year ending 31st December, 1905.

Accidents.—I am glad to report that the number of these is much less than for the preceding year. Out of twenty-two accidents reported and registered for the year, three were fatal, the remaining nineteen of serious nature, such as injuries to or fracture of limbs, concussions of spine or of brain, dislocations, enforced absence from work for fourteen days, &c., all of which come under the heading of "Serious injury to any person." In addition to these, a number of trivial accidents have been reported, which, not being of sufficient importance to register as accidents, are merely recorded by the Inspector, but not reported to the Head Office.

Fatal Accidents.—All of these—three in number—occurred at the Tasmania Gold Mine, Beaconsfield.

Robert Rasmussen, a surface hand, engaged trucking timber to the brace at Hart's Shaft, was assisting the braceman, Goldsworthy, and another man to put a piece of timber 9 in. by 12 in. by 8 ft. into a cage, when the stage on which two of them were standing suddenly gave way. Rasmussen fell 300 feet, and was instantly killed. His body was found lying, or hanging, across the piece of timber that fell away with him, which, in its descent, knocked large pieces out of the timbers, and at last lodged on the frames right across the compartment. This accident was the subject of an action against the company for damages, brought by the relatives of the deceased man, who alleged defective construction of the stage on which the men were standing when the accident took place. A lot of evidence—expert and otherwise—was taken, and the jury returned a verdict for the defendant company. The very large new pumping plant had, a short time before, been installed at this shaft. Alterations and enlargements had to be made to receive the larger plant, and in doing this it was found necessary to encroach even farther on the already narrow cage-compartment, which was provided for and was to be used exclusively by the "pitmen" in the future, and after all necessary alterations, re-skidding, &c., had been made to the main cage-compartments of the shaft. For the time being, however, this narrow cage was in use as a means by which men could descend and ascend into that portion of the mine, and as it could not be brought right up to the surface brace owing to the large sweep-rod overhanging some 8 or 9 inches, a staging had to be fixed 7 feet down, and from this the men going below entered the cage. I inspected the mine less than a week before the accident happened, and concluded my notes in the mine record book by drawing attention to the close proximity of the sweep-rod to the cage-compartment, and to the care necessary to be exercised by enginedrivers and bracemen, as in any case of over-winding with men a serious accident might occur, the cage coming into contact with the sweep-rod. With the staging I had no fault to find. It was well and securely constructed, and quite capable of sustaining, with perfect safety, the combined weight of a dozen men, could they find room to stand upon it. I was not aware at the time that short, and even fairly long, pieces of timber were at times sent down by this small cage. Inspection immediately after the accident happened, and the hearing of the evidence adduced at the coroner's inquest, did not appear to me to give any sufficient reason why that staging should give way if properly used, and with only the weight of one man and a piece of timber weighing less than 4 cwts. It was only on the following day that the discovery was made that this particular piece of timber bore on its end marks indicating that when uprighted on the stage it must have come into contact with the sweep-rod of the pump working at the time. The signs were unmistakable, viz., a mark on the sweep-rod corresponding with a partial indent on the end of the timber, the latter having paint from the former ingrained in its wood. Thus was the whole thing explained: the unfortunate man, Rasmussen, uprighted the piece of timber that was leaning against the wall of the shaft, and in doing so it must have got too near to the side of the small staging, and was caught by the down-stroke of the sweep-rod. Everything considered, and in view of the verdict obtained by the company in the action for damages, this accident may fairly be classed under the heading of "Unavoidable." The question was asked by His Honour, Mr. Justice Clark, before whom the case was heard, "Could not a shield have been erected to keep things which were being moved on the stage from coming into contact with the sweep-rod"? Such a shield could have been erected; but under the circumstances, and taking into consideration the already cramped space for getting into the cage, it would have been unwise to erect it. A low wall on the side next the pump guarded against men falling down there. Some allowance must be made for mine owners who are carrying out extensive alterations and construction works as in the case of the Tasmania Mine, and where pumping and other machinery must be kept going the whole time.

The occurrence of all mining accidents may be said to be attributable to, or at least come under the following headings:—(1) Negligence or want of reasonable precautions on the part of owners or managers; (2) carelessness or want of skill on the part of the men employed; (3) unavoidable, or that could not be foreseen or guarded against. As an Inspector, I consider it my duty to give in this report reasonably full particulars with reference to the serious and fatal accidents that occur, in order that it may be seen under which of the foregoing headings they may be classed. This must be my excuse for writing at length on the subject.

Second fatal accident: Peter Brown, employed in the sinking of Grubb's Shaft at the Tasmania Gold Mine, disregarded the warning call, "Look out for the cage," of the signalman, and deliberately stepped beneath the descending cage, and was instantly killed. I was at Hobart when this accident occurred. There was no occasion to return. The verdict of the coroner's jury was to the effect that no blame whatever was attachable to any one for this accident, and the fact that they (the jury) did not consider it necessary to view the place where the accident happened, was in itself significant enough.

Third fatal accident: Edward Mullins, employed as shift boss or foreman of a number of men at work sinking Grubb's Shaft at the Tasmania Gold Mine, met his death through a blasting accident. The shaft is a large one, 30 feet by 8 feet in the clear, about 18 men being at work in it at one time. Two safety-cages worked in their respective compartments on either side of the central, which is a ladder compartment. Sixteen holes were bored in the bottom of the shaft, and to charge and fire these Mullins retained the help of James Thos. Levings, Herbert Kerrison, and Thomas Wellington, sending the other men up to the 500-feet level, about 70 feet above the bottom. The usual practice in spitting a fuse is to prepare it by inserting a small piece of gelignite in the end to be fired, and thus ensure its spitting readily when a lighted torch or candle is applied. Mullins, who was a man of long experience in blasting and shaft-sinking, and who was also said to be a most careful man, had used the above-described method of preparing the fuse for lighting on all previous occasions when shots were fired under his direction in that shaft. On the day of the accident, however, he departed from his usual practice, and spit the fuses with lighted candles without gelignite. Some little time before charging the holes he asked one of the men if the fumes made his head ache when spitting, and getting a reply in the negative, said, "Well, it made my head ache, and I mean to spit them to-day with the candles and no gelignite." When ready for firing, Levings and Kerrison fired or spit the fuse in 8 holes on one side, Mullins and Wellington attending to the other 8. Levings finished first, and went to the cage. Some little delay was caused through Mullins going back to one fuse which he overlooked, remarking as he did so, "that they had plenty of time." The other men did not think so, and got into the cage at once. Mullins was about to enter a few seconds later, and after asking the others if they were all right, reached out his hand to pull the knocker-line. Just as he did so, the first charge exploded, all lights being extinguished. He (Mullins) called to the others, "Climb the cage," after which he was not heard to speak. Kerrison managed, with great difficulty, to climb to the top of the cage (14 feet), and after calling several times, made himself heard by the men in the chamber above, who at once signalled to heave up the cage, and on its reaching the chamber, where it was stopped, a dreadful sight met the gaze of those waiting there. Poor Mullins' body was half suspended on the inside of the cage, one arm being jammed tightly between the iron "long shoe" and the wooden skid, which latter had to be cut through before he could be released. By the time this was done life was quite extinct. The injuries to the head, side of face and upper part of body were of a very severe nature. Levings and Wellington were huddled together in the bottom of the cage. Kerrison had climbed to the top; both he and Wellington escaped with only slight injuries; Levings, however, was severely injured, and suffered much from cuts, bruises, and shock. The safety-cage in use at the time was the "long shoe" sinking type, more than twice the height of the ordinary cage, and being skeletal or open at the sides for two-thirds of its height, afforded but little protection from the flying fragments of stone. It is surmised that Mullins was not much injured from the effects of the first explosion that put the lights out, and that being unable to get hold of the knocker-line in the darkness, he by some chance got into the cage and attempted to climb up, when he was struck and fatally injured by the force of the second explosion. The fact of his arm being thrust through the bars of the cage and his body almost suspended, points to this conclusion. Levings, too, must have received most of his injuries in a similar manner, but having dropped right down to the floor of the cage where Wellington was crouching, escaped further injury. The whole of the 16 charges had exploded before the cage with the injured men could be got away from the bottom. The coroner's jury returned a verdict to the effect that Mullins met his death accidentally, and that no person was to blame for the accident.

With reference to the safest and most expeditious way to spit or light safety-fuse in blasting operations, there are different ways of doing it. The most common practice since gelatine dynamite has come so much into use, is to slit the end of the fuse diagonally into the powder core, insert a small wedge of gelatine or gelignite, which burns freely and spits the fuse almost instantaneously when a light is applied to it. Snuffing the fuse, *i.e.*, placing a candle-snuff beneath the fuse a little way back from the end, which, when lighted, takes some considerable time to burn through the fuse-envelope before reaching the powder-core, and thus gives plenty of time for men to get away, is perhaps the safest way; but miss-fires may sometimes occur through the fuse curling away from the flame before the powder-core is ignited, or it may be blown aside by the wind if in a draughty place. Electric firing, where a number of shots are required to be ignited simultaneously, is the safest method of any, as there cannot possibly be a miss-fire. The objection to this is that simultaneous firing in most cases is a disadvantage, and that the re-arranging of wires and making connections after each batch would take too much time were it required to fire a number of shots in groups; there would also be the cost of the apparatus and electric fuse connections. To insure quick and sure ignition without electricity, I do not know of any better way than the firstmentioned, viz., to slit the fuse and insert a small wedge of gelignite, assuming, of course, that good fuse is used, and not a defective kind that would run and cause the charge to explode before a man had time to get to a place of safety. It has been suggested that, for the safety of men employed in shaft-sinking, electric firing should be insisted upon, and no other method allowed. I do not agree with this; much better, I think, to let experienced miners follow the practice they have been accustomed to, always taking care to see that the best explosives and fuse, carefully stored and in good order, are used; also, that the men are provided with a speedy and safe means of getting away after lighting the fuse. In the case of the unfortunate man, Mullins, a miscalculation of time was the sole cause of the accident; it was only a matter of a few seconds, for had he got hold of the knocker-line, the accident would not have happened.

Non-fatal Accidents.—Thomas Bewes, in attempting to land timbers for the second brace being constructed at Grubb's

Shaft, Tasmania Gold Mine, missed his footing and fell to the surface brace, sustaining severe injuries—a broken thigh, dislocation of wrist, and slight concussion of the brain. He was in a very critical condition for a time, but finally recovered after several weeks' enforced absence from work.

Edward Pryde was struck on the back by a small piece of stone falling from the face at the Anchor Tin Mine, sustaining injury to the shoulder-blade, that caused him to be off work for fifteen days.

James Jeffray jumped off a truck when running out of the Briseis open-cut face, and sprained his ankle; also fractured small bone of his leg. Was off work for over fourteen days.

John Annear was timbering up drive in the Tasmania Gold Mine, which was left too long without being secured, when he was caught by a fall from the footwall, sustaining shock and concussion of the spine, that incapacitated him for over fourteen days.

James Scott was working in a level of the Tasmania Gold Mine, when a piece of stone fell from the roof and jammed one of his fingers badly. He was off work for fifteen days.

Joseph Miller, employed as lander at the pit-bank of the Catamaran Coal Mine, carelessly walked backwards and fell down the pit 30 feet, dragging the bucket-landing trolly with him. He sustained shock and a few cuts, that necessitated his being sent to the Hobart Hospital. He had only himself to blame for the accident. Was off work over fourteen days.

Charles Walker was lifting a large stone on to a truck at the Briseis Mine, when it slipped and injured his leg, which caused enforced absence from work for eighteen days.

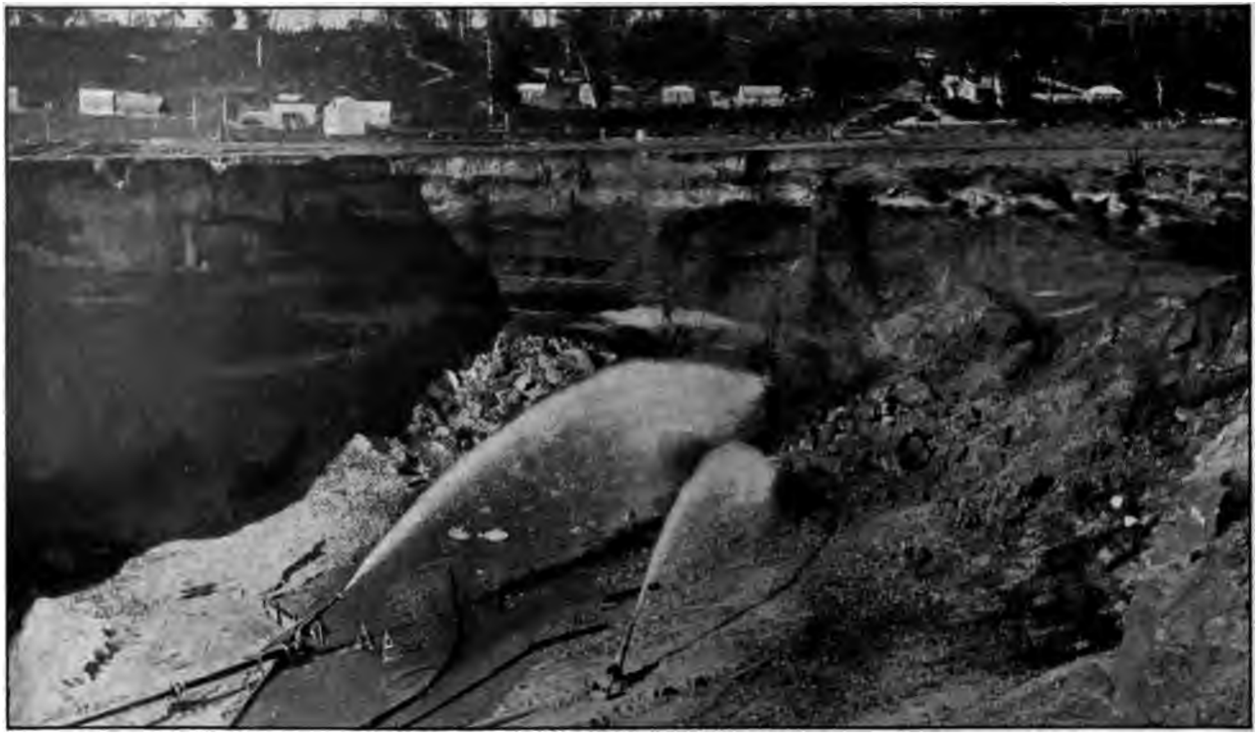
William Webb, shift boss at the New Golden Gate Mine, was down a winze some few feet, when dirt, accidentally tipped from a passing truck, fell on him. He sustained cuts and bruises about the head and shoulders, also injury to a finger, and was off work for seventeen days.

Charles Maizey was lowering timber into a winze at the Tasmania Gold Mine. It lodged near the bottom, and then slipping lower, jerked the windlass-rope in such a way as to bring his hand against the post with such force as to break two or three of the small bones. He was nearly six weeks off work through this accident.

Donald Lyons, while endeavouring to lift a truck on the line at the Tasmania Gold Mine, got a portion of one of his fingers jammed off, a second finger being badly bruised. He was off work for over fourteen days.

Benjamin Cowie was assisting to lift a cap-piece into position in a stope at the Tasmania Gold Mine, when he was struck on the chin by a piece of wood, the injury causing him to remain away from work for fifteen days.

Josiah Trounce was knocked off a stage in Grubb's Shaft, Tasmania Mine, by a descending bucket, and sustained cuts and bruises, but not of a very serious nature. The cause of this accident was thoroughly investigated. A new hand had been put on to relieve the signalman, whose duty it was to watch the working of the cages and buckets from below, signal for hoisting or lowering, and give warning to the men employed when a bucket or cage was coming down. Some blame was attachable on both sides—to the foreman for putting an inexperienced man to look after the signals with-



Pioneer Tin Mine, Bradshaw's Creek.

out giving him definite instructions how to act, and to the signalman for doing other work, attending to the men, &c., when he should have been watching for the descending bucket.

Edward Paul, a trucker, was descending a winze at the Tasmania Consols Gold Mine, Mathinna, when he fell from the ladder to the bottom, 35 feet, got a severe shaking, also cuts and bruises, but no bones were broken, and he was able to resume work within fifteen days from the time of the accident. In this case, blame attached to the manager, as the ladder from which Paul fell was placed or fixed in a vertical, and in one part almost overhanging position, contrary to Gen. Rule XXIV. Very long timbers had at times to be lowered in this winze, and as much room as possible was required to be given. Inclining the ladders would perhaps interfere with this.

James Thomas Levings was very seriously injured in the blasting accident that caused the death of Edward Mullins in Grubb's Shaft at the Tasmania Gold Mine, and which has already been described under "Fatal Accidents" in this report. His injuries—cuts, bruises, shock, &c.—were so great as to cause an enforced absence from work for fifteen weeks.

Thomas Kimp was attending to diamond-drilling machinery at Mount Rex Tin Mine, when he got a finger of one hand badly crushed in the wheel-gearing. He went to the Launceston Hospital, where he remained a few days for treatment. This accident comes under the heading of "Serious," and is therefore recorded.

Joseph Martin Brent, caretaker on the Briseis Tin Mines' water-race, was struck by the branches of a falling tree, and sustained a fracture of the small bone of his arm, also bruised ankle, which caused an enforced absence from work for fifteen days.

Donald McDonald was assisting in taking off a swing-cage at the New Golden Gate Mine, when he got his arm jammed between the cage and the king-post of the shaft. No bones were broken, but he lost nineteen days off work through the injuries received.

Thomas Johnstone was working forward to make ready for timbering in a stope at the Tasmania Gold Mine, when he was struck by quartz falling from the roof and sustained injuries—shock and bruises—that necessitated treatment at the hospital for sixteen days, after which, it is understood, he was all right.

Samuel Knowells was cleaning the end of the pump sweep-rod at Hart's Shaft, Tasmania Mine, when he slipped and fell into the bob-pit, sustaining a broken leg, and enforced absence from work for a considerable time.

Inspection Generally.—The principal mining centres have been visited and mines inspected as frequently as the time at my disposal would permit, sometimes bi-monthly, but more often after a lapse of three, or even four, months were inspections made. The coal mines in the southern part of the State, Colebrook, Sandfly, Mt. Cygnet, and Catamaran were inspected in April, and again in October, of the past year, 1905. The new coal find at Preolenna, south of Wynyard, was visited in February. Mount Cameron Water-race business, visit with the Minister, making survey, designing new work, &c., occupied a good deal of my time. I had also a good deal to do apart from actual inspection of mines. Roads and tracks had to be reported on, sometimes entailing a special visit to a locality. A couple of weeks were spent in visiting, with Mr. Twelvetrees, Government Geologist, the Blue Tier, and preparing a report for the information of the Hon. the Premier, having reference to various matters in connection with dam-sites, storage areas, catchments, value of tin deposits, and water supply generally; also, advisability of granting certain dam-sites applied for. The drafting of the new Mining Act and Regulations also made a call on my time, as I was frequently required by the Parliamentary Draftsman and Mr. Twelvetrees, Government Geologist, to assist in framing the part relating to Inspection of Mines.

Ventilation.—The ventilation of the metalliferous mines in the Divisions under my inspection is generally good. The Tasmania, at Beaconsfield, has been ever a most difficult mine to ventilate, owing to the large quantity of natural gas in the strata. Much has been done under the new management, and fairly good average results produced. Shaft-connections have helped a lot, but until thoroughly equipped with a powerful exhaust-fan it is useless to look for uniform and adequate ventilation. The Root's blower now in use, and which has been converted into an exhaust, is of very little use when it is most wanted; that is, when some sudden atmospheric change takes place, and natural ventilation can no longer be depended upon. I have taken measurements and velocities of air-currents in this mine at times, and found everything most satisfactory; yet, within twenty-four hours, and after a change had taken place in the direction of the wind, generally from south to north or north-west, the latter being a particularly bad quarter, the men had to be taken out of nearly every part of the mine east of the main crosscuts. So much has been going on in the way of erecting new buildings, poppet-heads, winding machinery, and the installation of the first of three very powerful Cornish plunger-pumps (two more to be put in at Grubb's Shaft when it is sunk to the required depth) during the year, that very much attention could not reasonably be expected to be given to the question of ventilation; a good deal has, however, been done in the way of connecting the old Lefroy Shaft with the workings. Grubb's Shaft will soon be down to the 1000-feet level, and when the sinking of this is finished and a powerful exhaust-fan put into use at the former, or Lefroy Shaft, good ventilation for the whole should be made easy. Second only to coping with the water, is the question of good ventilation for a big mine like the Tasmania, and this must come, for apart from what is required under the Act and Regulations, the successful working of the mine will in a great measure depend upon it. Shifting men about from place to place, or finding work for them to do elsewhere, when the ventilation of certain parts, very often most parts, of the mine is unfit for them to work in, as was the case a few years ago in this mine, will not do under the present progressive management.

The North Tasmania is another of the Beaconsfield mines where natural gas is very troublesome. Recently this mine has been equipped with a steam-winding plant, to take the place of the horse-whim formerly in use. A small blower was also provided to help ventilation, but was not of much use. I found it necessary, when visiting the mine the first time after this machinery was installed, to call the men (only 4 or 5) employed out of the mine, as the ventilation was not good enough. Some attempt was to be made to connect the 300-feet level with an old shaft further south, but this has not been done, so far.

At the New Golden Gate Gold Mine, Mathinna, the ventilation has been fairly good. No alteration, however, has been attempted to reverse the air-currents. The main shaft is still up-cast, the cold air entering the mine from the surface connecting airway at the south stopes. The objection to this made in my last annual report still holds good, viz., that in the event of a fire occurring in the mine, the smoke and fumes would pass to and up the main shaft, which is the only way by which men could escape in a cage from the mine. Recently (19th December) a fire occurred at the 1400-feet plat at this main shaft. Happily, there were only a few men in the mine at the time, otherwise serious consequences might have resulted. At 3.30 a.m. the men working at No. 17 (1600-feet level) knocked for the cage, and on coming to the surface reported a fire below, but they did not know at what level. Shift boss Wm. Webb, with the braceman, then went below to investigate. Several levels were examined, but no sign of fire, other than a little smoke hanging about in places, until No. 13 was reached. There the smoke was very dense for 150 feet along the crosscut, beyond which point all was clear—no fire. On attempting to descend to the next level, No. 14, they were met with thick volumes of smoke coming up the shaft, and not daring to go further, they had to return to the surface without locating the fire. The men working at No. 15 (1400-feet level) did not notice any fire on leaving at half-past eleven the night before; but everything pointed to the fire being in that level, probably in a dry timber-stack supporting the roof of west No. 1 reef. Some of the men suggested, or appeared to think, their candle might have lighted the boards of an old magazine about the same place. At 7 a.m. the fire was evidently in full progress down below, sending up smoke and small charred pieces of wood to the surface. Nothing could be done but let it burn itself out, which, to every one's surprise, it did within thirty hours from the time it was first discovered. On going below at 8 o'clock on the morning of the 20th, it was found that the fire took place in east plat, No. 15 (1400-feet level), burning about 5 feet of leg and about 18 inches of cap, and some laths. The men who were working at that level brought their spiders away with them, but it is surmised that a candle had ignited the wood, and that when bailing was commenced after they left, a spark was fanned into flame. Fortunately, but little damage was done by this fire, nor was the working of the mine delayed for very long. Some miners are careless in handling lighted candles, and require to be frequently reminded of the danger of sticking candles on dry timbers in a mine. I have myself discovered, on one occasion, a leg on fire in this mine, and have strongly urged on the management the necessity for greater care being taken to avert accident from fire in this way. It is to be hoped that now the risk attendant on careless use of lighted candles in the mine has been brought home to those most concerned, more care will be taken to guard against this danger in future.

Tasmania Consols Mine.—Ventilation in this mine is, as a rule, fairly good, yet there are times when the temperature is rather high. As at the "Gate Mine," they, the Consols, are dependent on natural ventilation, excepting for the exhaust from the rock-drills. The two mines adjoin, the working shafts being not more than 100 yards apart, the boundary-line being a little nearer to the "Consols" than to the New Golden Gate shafts. Connecting drives could be constructed between these two mines without any great cost. Already drives have been extended to the boundary on either side, but there is some difference of level, the bottom level (1400) of the "Consols" mine being some 25 feet lower than the 1400-feet level at the "Gate" mine. Now that the new Act (1905), coming in force from the 1st January, 1906, provides that mines adjoining, and where the works are not more than 300 feet apart, shall, upon the order of an Inspector, be connected by drives at the cost of the owners, &c., an improvement in the ventilation of these two mines could be easily made by such a connection.

Coal Mines.—With regard to the ventilation of these, the smaller ones, and these represent eight-tenths of the whole, are, as a rule, good enough. The workings are not extensive, and are for the most part reached by short tunnels into the hillside. The larger collieries, however, are beginning to experience difficulty. The Cornwall Mine, the workings of which are on the pillar and bord system, has not had good ventilation of late. The bricking-in of the furnace at the up-cast shaft, most necessary to be done, had been put off until at last it was insisted that the work be carried out without further delay, and it was to be put in hand during Christmas holidays. A special visit was made to this colliery in August, when it was found to be in an unsatisfactory condition as far as the ventilation was concerned. The main heading (a tunnel from the surface) is in about three-quarters of a mile, and the seam has been worked pretty extensively on either side of this for nearly the whole way. The back-heading used for a return air-way, and which connects with the up-cast furnace shaft near the entrance to the main tunnel, was found to be in a rather neglected condition; at different places the roof had come down, partly blocking the drive, the sectional area of which was at best rather small for a return air-course. Work was going on at eighteen places, eleven of these being on the west side of the main heading. The temperature ranged from 53° F. at surface entrance to 66° in first part of the main heading, and up to 74°, 76°, and at last, three places coming to the return air-way on the east side, 79°. Here the air was much vitiated, the tallow flare-lamps used by the men burned dimly; candles could not be kept alight. A pure atmosphere could not, of course, be expected at this return, when the air had already circulated through fifteen working-places; but had the return air-drive been kept well open, and with proper furnace accommodation at the up-cast shaft, such a bad state of affairs could not exist. Preparations are being made for the installation of an electric motor service at this colliery, to take the place of the steam cable-hauling plant now in use. This, no doubt, will save cost in working, but until the mine is properly ventilated, and this must be looked to as speedily as possible, it is of no use for the owners to look for satisfactory results. Already too much time has been lost, and unless steps are now taken by the management to improve the ventilation of this colliery, there will be no option for the Inspector but to recommend that proceedings be taken to enforce compliance with the requirements of the Act and Regulations.

Mount Nicholas Colliery.—On the whole, the working of this colliery has been fairly satisfactory. It is worked under the "Long-wall" system. The ventilation is produced in the same way as at the Cornwall Colliery, that is, natural ventilation assisted by a furnace at the up-cast shaft. The return air-way is now in fairly good order, and with proper attention to the firing at the up-cast good ventilation can be produced. An improvement has been made by extending a drive from the workings east of the main heading to day-light on the south-eastern slope of the hill. This serves to help ventilation, also as an "escape" from that part of the workings. Long-wall is the most expeditious system of working coal-seams up to 5 or 6 feet in thickness. Ventilation is more easily produced in a sweeping current along the continuous face than in pillar and bord; in the latter the air has to be carried into each "bord," generally by means of bratticing. The Cornwall Mine owners would do well to revert to the "Long-wall" system. The wonder is, they have not done so long ago.

Sandfly.—Not much has been done in the way of mine-development during the year, attention being chiefly given to the construction of the tram line to North-West Bay, jetty building, &c. A lot yet remains to be done before this line, which will be some 12 miles in length, is complete. Why such a long line of tramway, on stiff gradients and entailing heavy cost for construction, not to speak of the after-cost of working and maintenance, should be undertaken, when the construction of a self-acting incline line directly down the mountain side for a mile and a half or so, and to connect with an easy gradient line of tram extending in 5 miles or so to the jetty, could be carried out is not easily understood by anyone knowing the country and possessed of even a small amount of engineering knowledge.

With reference to the other coal mines, all small in their way, in the State, there is not much to report. There is, I believe, an all-round improvement in their system of working, as far as safety for the men is concerned. They all work intermittently, and where the facilities for getting the coal to market are good, they manage to do fairly well. A new mine has been opened at Catamaran (Recherche Bay) by the Catamaran Coal Co. A couple of pits have been put down about 150 feet apart, and to a depth of 30 feet. A nice seam, from 4 to 5 feet in thickness, has been worked. The coal is of good quality, rather soft as yet, as the covering of fire-clay and shaly substance is not impervious to surface water. The seam is dipping to the north-west beneath a flat, the surface of the ground sloping in the same direction for some little distance before the flat proper is reached. The method of working, so far as the pit-head gear and hoisting arrangements are concerned, are most primitive; underground, things are not so bad.

Ropes, Cages, Chains, Shackles, &c.—These have received careful attention, and wherever found defective have been condemned. Spare cages are generally provided to replace defective ones. One cage at the Tasmanian Consols Mine being badly defective, had to be condemned, and as there was none to replace it, the work of shaft-sinking had to be suspended for four or five days until another cage was procured. The management has only itself to blame for the delay, as notice was given three months before to provide a spare cage in case it should be wanted. It would never do to allow a defective cage to be used in a shaft over 1300 feet in depth, and where men were employed sinking. The men themselves demurred somewhat at first, but afterwards acknowledged that the Inspector was right.

Some small ropes, windlass generally, had to be condemned. Engine-hauling ropes receive more care and attention from owners now than heretofore, and as a consequence it is rarely that we hear of a rope breaking in these days; especially so is this the case with regard to big mines. One whim-bucket had to be condemned. It was a wretchedly bad one, and was used in a shaft where men were sinking 500 feet below the surface.

Magazines and Explosives.—The magazines for the most part are fairly well, in some cases very well, kept, both above and below the ground. It is, however, difficult to get some miners to understand that careful storing in dry, well-ventilated places is necessary to insure not only safety, but also the best results being obtained from any kind of explosive.

Gelignite destroyed.—Fifteen cases, 750 lbs., of really bad stuff had to be removed from the Anchor Company's magazines at the mine and at St. Helens, and destroyed. It was over a year on hand, was in a partly-frozen state when first received, and subsequently underwent frequent freezings and thawings. A sample sent to Mr. Ward, Government Analyst, was pronounced to be no longer fit for use, transport, or storage. In destroying this, I had it removed to an out-of-the way place, the plugs taken out of the boxes, laid out in long trains (not more than three plugs abreast), and then fired the trains from the windward end. A number of detonations occurred, blowing a few plugs away and breaking the train, which had to be re-lighted. It was noticeable that these generally took place when the wind sprung up, making the fire burn more fiercely. Hard plugs detonated quite as readily as the soft ones when the heat of the fire increased. This work was carried out as part of my duties as Inspector of Explosives. (Expenses paid by Explosives' Inspection Department.)

General.—The open-cut tin mines on the East and North-East Coast were, I am glad to report, pretty free from accidents, some seven or eight only being reported, and none of these of a very serious nature. The very high price of tin has given a great impetus to mining on the Coast. The first

Briseis dividend is to be declared shortly. Too much praise cannot be given to Mr. Lindesay Chark, general manager of this mine, for the able way in which he has pulled things together, and by engineering skill and good management has placed the mine on the dividend-paying list.

Bucket-dredging.—The Gladstone Tin Development Company started their No. 1 bucket-dredge on the Ringarooma River, near Gladstone, in the early part of August. A series of breakages took place at the commencement, and it was found that the one high-speed engine employed could not be employed to drive the fast-running centrifugal pump and slow-working buckets and trommel successfully. A second engine was obtained for the buckets and trommel. A further delay was caused through having to dredge a way through a clay and slate point before getting into the regular stope of wash-dirt. Progress has since been made, with varying success. The flat was formerly heavily timbered, and now being covered by tailings from 3 to 5 feet in depth, it is most difficult to cope with the stumps, tree-trunks, and branches buried up therein. Some fairly-good weekly returns have been obtained, and I think it may be fairly predicted that bucket-dredging will prove a success on our tinfields. The dredge under review was badly designed to commence with; this, followed by faulty workmanship, has caused much trouble, and has no doubt given rise to an erroneous impression that bucket-dredging is not suitable for tin-getting. I am not of this opinion, and see no reason why bucket-dredging, which I hold is the only means by which the river beds and adjacent flats can be worked, should not be a success on the Ringarooma River.

LIST of Accidents in Inspector Griffin's District for the 12 months, 1st January to 31st December, 1905.

Fatal, 3 ; non-fatal, 19 ; total, 22.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1905. 7 Jan.	Tasmania G.M.	Beaconsfield	Fall from stage	Bews, Thos.	Married	Broken thigh and concussion of brain	Was working on a stage, and whilst pulling some timber slipped and fell about 26 feet.
11 Jan.	Anchor T.M.	Lottah	Falling stone	Pryde, Edwd.	Ditto	Bruised shoulder	Working at No. 2 bench, and was struck by a stone which rolled from No. 1 bench.
10 Feb.	Tasmania G.M.	Beaconsfield	Fall of stone	Annear, John	Ditto	Concussion of spine	Working in a stope, when part of the hanging-wall came away and struck him.
4 Feb.	Briseis T.M.	Derby	Fall off truck	Jeffrey, Jas.	Single	Sprained ankle	Was braking a truck down tramway, and slipped off.
27 Feb.	Tasmania G.M.	Beaconsfield	Fall down shaft	Rasmussen, Robert Wm.	Ditto	Fracture of skull, legs and arms broken, &c.	Was helping to place piece of timber in cage at surface ; the stage on which he stood gave way, and he fell down the shaft for about 300 feet. Injuries fatal.
22 Feb.	Ditto	Ditto	Fall of stone	Scott, James	Ditto	Crushed finger	Was working at No. 3 level, when a piece of stone fell and crushed his finger.
6 Mar.	Catamaran Coal	Recherche	Fall down shaft	Miller, Joseph	Ditto	Shock and cuts	Whilst attending to skip at surface fell down shaft on to a platform about 30 feet below.
8 April	Tasmania G.M.	Beaconsfield	Struck by descending cage	Brown, Peter	Married	Broken spine, &c.	Stepped beneath descending cage, and was crushed up.
27 May	Briseis T.M.	Derby	Rolling stone	Walker, Chas.	Ditto	Bruised leg	Was lifting stone into a truck ; his foot slipped, and the stone rolled on to his leg.
27 June	New Golden Gate	Mathinna	Fall of dirt down winze	Webb, Wm.	Ditto	Cuts on head and crushed fingers	Was working in winze. Some loaded trucks, which were crossing the winze, capsized, and some of the material fell on

							jerked the rope; the timber lowered another foot, and the rope pulled his hand against the windlass-frame.
19 July	Ditto	Ditto	Lifting truck	Lyons, Donald	Single	Loss of finger	Was trucking at surface, and in trying to lift a truck on to the line had the second finger of his left hand jammed off, and the third badly bruised.
27 Aug.	Ditto	Ditto	Descending bucket	Trounce, Josiah	Ditto	Cuts and bruises	Was struck by descending bucket and knocked off a stage to the bottom of the shaft, about 8 feet, sustaining several cuts and bruises.
28 July	Ditto	Ditto	Struck by cap-piece	Cowie, Benjamin	Married	Cut chin	Was lifting a cap-piece on to the legs, and it struck him on the chin, causing a cut which required stitching up.
5 Sept.	Tasmanian Consols	Mathinna	Fall down winze	Paul, Edw.	Single	Cut head and bruises	Going down ladder in winze; he slipped and fell to the bottom, a depth of about 35 feet.
13 Sept.	Tasmania G.M.	Beaconsfield	Explosion of gelignite	Mullins, Edw.	Married	Fractured skull, broken arm and thigh	Was helping to fire a round of 16 holes in Grubb's shaft, and miscalculated the time of the fuse. Injuries fatal.
13 Sept.	Ditto	Ditto	Ditto	Levings, Jas. Thomas	Ditto	Cuts and bruises	Was helping Mullins to fire the round as above.
10 Oct.	Mount Rex T.M.	Avoca	Drilling-machine	Kimp, Thos.	Single	Crushed finger	Was assisting with diamond-drill, and had little finger of left hand crushed by the cog-wheels.
23 Oct.	Briseis T.M.	Derby	Falling tree	Brent, Jos. Martin	Married	Broken arm, &c.	Caretaker of water-race. Was knocked down by falling tree.
15 Nov.	New Golden Gate	Mathinna	Swinging cage	McDonald, Donald	Ditto	Bruised arm	Assisting to take cage off for repairs; it swung round and jammed his arm against king post.
19 Dec.	Tasmania G.M.	Beaconsfield	Fall of quartz	Johnstone, Thos.	Ditto	Bruises and shock	Was making ready for erection of a set, when some quartz fell on him.
29 Dec.	Ditto	Ditto	Fall into pit	Nowells, Samuel	Ditto	Broken leg	Cleaning end of sweep-rod of pump, and fell into bob-pit.

Mr. **Inspector Harrison** (stationed at Zeehan) reports:—

In submitting to you my annual report, I am pleased to be able to state that the accident-list is considerably less than for the previous year, being as follows:—Fatal 1, serious 5; as against fatal 3, non-fatal 11, in 1904.

Ropes and Cages.

Ropes and cages have been tested as required; several of the former have been put out of use.

Ventilation.

The ventilation of the various mines is as good as circumstances will permit. There has been no complaint in this respect.

Magazines.

There are a large number of magazines in the district; most of them are connected with the various mines. During the last quarter of the year the larger ones, used by merchants for storing large quantities of explosives, have been removed outside the town boundary, to the reserve laid off for that purpose.

Legal Proceedings.

It has not been found necessary to take any legal proceedings with respect to the working of the mines during the year.

The results obtained during the year have fully borne out my expressed opinion in my last report, while the continued good price obtained for the various minerals won from the district, and the energetic manner in which mining is being pushed ahead, leads me to anticipate that the output for the present year will far exceed both in quantity and value that of 1905. Following is a short report on some of the principal mines of the district:—

Zeehan.—Mount Zeehan (Tas.).—This property is looking very well. The deeper levels show abundance of high-grade ore. The manager has laid off a new main shaft, and is now busy erecting powerful pumping and winding machinery on the site. Mr. T. Vincent, general manager, sends the following report on the work done during the past year:—

Spray Mine.—Drives on lodes, 824 feet; rises, 300 feet; and winzes, 120 feet. Of the latter, 110 feet were sunk below the bottom working-level, where the lode is 10 feet wide, composed of antimonial galena, worth, per ton, £7. At 105 feet we have started drives both north and south, which are worth, per lineal foot, £38. This shows we have a rich body of ore at the deepest point, and when we take into consideration that the upper level is driven 520 feet through pay-ore, it does not require an expert opinion to tell one that our prospects for 1906 are as good as one could wish for. It has also given the company a sufficient guarantee to provide the funds necessary to equip and sink a new main shaft, which work is now in progress. Some thousands of yards of mullock have been removed, to clear a site, and when the powerful machinery which is being made by Salisbury's Foundry Co. is installed, sinking will be carried on rapidly. By carrying out the new work, it shows the company has every confidence in the future success of the property. The output of marketable ore for 1905 was 5018 tons, and value £42,557. For 1906 we have every reason to expect a greater output and value.

No. 2 Shaft.—Drives on lodes, 549 feet; crosscuts, 110 feet. At this mine the ground is very hard, hence development is slow and expensive; nevertheless, on No. 30 lode, out of 156 feet driven, the last 56 feet are in pay-ore, the face showing a fairly good lode. On Nos. 10 and 15 lodes we have driven a considerable distance through barren ground, which has been very much disturbed. It is our intention to keep these drives going, as we feel sure that eventually we shall be repaid the outlay.

During 1906 we purpose sinking the shaft another 100 feet, and thus open up pay-ore known to exist below the present working-level. Our prospects for the future are decidedly good. The output for 1905 was 1288 tons, and value £21,099. The class of ore raised from this mine is of a high grade, hence the cost of development is not felt to the extent it would be if the ore were of poor quality.

Zeehan-Montana.—No. 1 shaft: This mine never looked better than at present. Large bodies of ore are available in the various levels, while the manager has the progressive work well ahead of the ground that is being mined. No. 2 shaft has been sunk to a depth of 400 feet. A drive is being put in to strike No. 1 lode (so favourably worked in the past). A few more days should see this work accomplished.

Zeehan-Western.—This company is giving employment to a large number of tributors, with remunerative results; while the deeper levels are showing better and more encouraging prospects.

Florence.—Manager has put down a winze in the bottom main level on a shoot of good ore. It is more than probable that arrangements will be made to sink the main shaft.

Watt & McAuliffe.—This mine, which has been very successfully worked by a party of working men, has changed hands. It has been taken over by a Victorian company, and is now called the Austral Valley. The manager is busy erecting pumping and winding plant in a new main shaft. He should be in a position to win ore by the end of March. The prospects of the mine are good.

Victorian-Zeehan.—This company has a good plant, and has started two prospecting drives at the 100-feet level. On the old Maxim property, pumping and winding machinery is in the course of erection.

New Mt. Zeehan.—A few tributors at work. The same applies to the Oonah, Silver King, and a number of other mines.

Comstock and Heemskirk.—At Comstock several mines are at work. The South Comstock is still turning out good ore, while several others are obtaining parcels of zinc-blende under favourable circumstances.

Mayne's Tin Mine is still turning out tin in payable quantities, last quarter's return being valued at £1100 net.

There have also been several new discoveries on the slopes of the Mount. On McIvor's some very rich tin has been found. The property is under offer to a Victorian syndicate. The Public Works Department has cut several tracks up the Mount, for the benefit of the prospector, and in every instance the result has warranted the outlay.

Dundas.—The Comet Mine is still being worked satisfactorily on the tribute system. No. 3 level is being unwatered. Large consignments of fluxing-ores go from this mine to the local smelters.

South Comet.—This mine is worked principally for fluxing-ores. Four thousand tons were sent out during the last quarter.

Red Lead is another mine worked for the same purpose.

North-East Dundas and Mt. Read.—Renison Bell T.M. Co. is being prospected by a syndicate who have the mine under offer. They are working the alluvial with profitable results. There are a number of small parties at work in the same locality.

Fahl Ore Mine, or *Ring Valley*, on the Ring River, is still sending consignments to the Mt. Lyell Smelters.

Mount Read Company's main adit is being pushed ahead with all possible speed.

Hercules.—I regret to state this valuable property is still idle.

Rosebery and Mt. Farrell.—The *Primrose* and *Tas. Copper* companies are sending out large quantities of ore for the local smelters; they are also sending ore to the Blinman, South Australia.

North Farrell Mine is keeping up its output, and has large reserves of ore in sight.

At the *Murchison*, the erection of the new dressing-mill is nearing completion. Manager has several thousands of tons of ore at grass, ready for treatment, and a strong lode to work on.

The *Mackintosh* and several other mines are at work.

Waratah, Whyte River, and Mt. Stewart.—At Waratah we have the Mt. Bischoff, Bischoff Extended, Weir's Surprise, Wombat, Badger, and several others busy tin-mining.

At the Heazlewood there are the Victorian Magnet, the Washington Hay, and others.

At Mt. Stewart the Long Tunnel is sending out ore for the Zeehan smelters.

The Magnet Mine is turning out large quantities of galena and fluxing ores. Several new developments have taken place during the last few months in this mine.

South of Zeehan.—A tram line over 5 miles long is being constructed from Eden Station to a mine best known as McKimmie's, near the Henty River. The mine has been taken up by a private gentleman, and he has a large quantity of ore on hand to send to the smelters directly the tram is completed.

Red Hills.—At the Red Hills prospectors are again at work, in the interests of the Mt. Lyell Co.

Stanley River.—The alluvial flats on the Stanley have been taken over by a strong syndicate, and active operations started. The ground is known to contain rich tin, but it will depend on the results of boring, nature of bottom, &c., what system will be adopted to work the mine, whether it will be hydraulic-lifter or bucket-dredge. I feel sure that this somewhat neglected field only requires a little more energy put into it to place it on the list of the remunerative tinfields of the State.

During the last quarter of the year it was found necessary to close down the Zeehan-Queen for a time. Against this we have the starting of the Victorian Zeehan, Maxim, and the Austral Valley, all equipped with good pumping and winding plants.

LIST of Accidents in Inspector Harrison's District for the 12 months, 1st January to 31st December, 1905.

Fatal, 1 ; non-fatal, 5 ; total 6.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1905. 27 Mar.	Zeehan-Montana	Zeehan	Explosion	Meredith, John	Married	Scalp wounds, broken limbs, &c.	Meredith and his mate, Wroe, returned to the face immediately after firing two shots, for the purpose of firing another charged hole ; just as they reached the face this third charge exploded. Meredith sustained severe scalp wounds, loss of one eye, left arm and right leg broken, and numerous wounds on face and body.
27 Mar.	Ditto	Ditto	Ditto	Wroe, Herbert	Ditto	Cut lip and bruises	Was with Meredith as above ; severe cut in upper lip, and bruises.
4 July	West Comet P.A.	Dundas	Detonator exploded	Miller, Harry	Ditto	Loss of two fingers and lacerated hand	Knocked sawdust out of primer, and was looking to see if it was clean, when it went off, shattering his hand.
18 July	Florence S.M.	Zeehan	Machinery in motion	Carey, John	Single	Left arm broken	Was attending one of the jigs, and got on top of it to clear a shoot. The seam of his coat caught a key in the shafting.
31 Aug.	Ditto	Ditto	Fall of stone	Loveridge, Jas. E.	Married	Injury to leg	Was going into stope, when some stone fell from wall and struck him on the leg, causing a wound and slight splintering of bone.
3 Sept.	West Comet P.A.	Dundas	Fall of timber and mullock	Chatters, Henry	Single	Crushed to death	Was repairing a stope, when some mullock and timber fell and crushed him.

Mr. **Inspector Curtain** (stationed at Queenstown) reports:—

A summary of the casualties in the Lyell Division of the Western Mining District for the past year is as follows:—Fatal, 3; serious, 7; not serious, 7. They were confined to the mines hereinunder mentioned; viz.:—

Mount Lyell Mining and Railway Company, Limited.—

Alfred Ernest Walsh, single, age 24 years, engaged as miner in the North Lyell Mine, was killed instantaneously by a fall of schist in the "B" stope. The cause was attributed to Walsh knocking out a piece of timber that had been placed as a sole-piece to take the flooring of a mullock-chute—taking weight as a "tom"—which, when liberated, permitted the ground to fall, and occasioned the accident.

William John Kelly, single, aged 26, an ore-filler, was decapitated after jumping off an uncontrolled balance-rake of loaded trucks on the mine side of the main haulage.

Ernest Frederick Rdzberg, married, aged 58 years, a line-repairer, had his skull fractured in the preceding accident, ankle dislocated, and body severely bruised and shaken.

A line-ganger was with Kelly and Rdzberg, and gave the alarm when the trucks parted from the rope. Beyond a severe shaking, he sustained no other ill-effects, and resumed duty after the enquiry.

The particulars relative to this casualty are, that without any warning the rope broke from the curved or turned-back (shod) wires at its extremity, and drawing through the metal permitted the load (12 tons with men) soon after its departure from the top to get away on a steep—1 in 3—gradient. The men were riding on loaded trucks, and at the enquiry the jury added a rider recommending amendment of the company's rule, to the effect that no person should be permitted to ride on loaded trucks in the future. Rdyberg was idle for some time, but is again working for the company. The rope was 4 inches in circumference, 6-strand, 7 wires per strand, and made of best ploughed steel, and therefore possessed a more than marginal factor of safety.

In mounting these end couplings, the custom is to "thread" the rope longitudinally through the shoe, serve, and unreeve about a foot of the wires, half of which are cut off, and the balance turned back in 6 and 9-inch lengths. The shoe being cone-shaped, is then "swedged" over the latter, until the longer lengths approach its leading collar, when the interstices are filled with a specially-prepared white-metal. This method was inaugurated at the haulage, and without any alteration continues to the present.

Richard Dillon Ross, single, age 41 years, a quarryman, working in "No. 2" bench of the lime-quarry, met his death under somewhat peculiar circumstances. His particular duty at the time was watching the movement of an expected transverse fall of permanently battered ground, in order to warn his mates. This he did, and as the mass began to finally settle and come away, he began running, and had reached a distance of 144 feet from the base of the face, when the major portion of the fall overtook and buried him to such an extent that before relief could reach him he was smothered.

Donald McLean, single, aged 41 years, a slag-wheeler at the reduction works, had his right leg broken by the fall of a cast-iron launder which he was removing from "No. 8" furnace. Other complications following, keep him under medical attention.

Henry Charles Frost, married, aged 39 years, a repairer, working in the "No. 2" sub-stopes at the 600-feet level of the North Lyell Mine, was, with others, engaged withdrawing timbers for the purpose of making room for an ore-chute, when, chiefly from side-pressure, the section collapsed, and causing Frost to fall to the level below, broke his right leg between the ankle and knee, from which he is still suffering. Had the off-side timbers been "tommed" as the front timbers were relieved, this accident could not have happened.

John Patrick Keating, widower, aged 36 years, a lever-man at the "No. 6" hydraulic stand of the converters, was somewhat severely burnt about the arms, elbows, and throat by an overflow of matte from the vessel which he was regulating. Realising the danger his action occasioned, he stuck to his post, recovered his vessel, and thereby averted what might have proved a matter of more serious consequences. He is about, and making a recovery.

Lyell Blocks Mining Company, No Liability.—Charles Powell, single, aged 28 years, a general hand, was engaged "lathing up" a pass in the "No. 1" level stopes of the balance shaft, when a quantity of earth fell on him from the adjoining set and caused serious injuries to his back and legs. Powell left the Queenstown Hospital in the middle of last March for his home in Daylesford, Victoria, and late advice from there states that he is still suffering.

A close investigation was made into this accident, and I came to the conclusion that Powell, by his own actions, did not contribute to his injury.

Lake Jukes Mining Company, No Liability.—Luke Richards, married, aged 58 years, a labourer, working in the wheel-pit, struck an unexploded piece of gelignite with a pick, that going off caused serious injuries to his head and eyesight. One eye was destroyed.

The circumstances are, that a round (7) of holes was fired and their explosions accounted for, but the full charge of one evidently failed to detonate until struck by Richards. Fortunately, the direct force passed over the man's shoulder, otherwise the result must have been more serious, if not fatal. He subsequently resumed work as a battery-feeder, but his eyes proving troublesome necessitated his recently seeking further medical advice.

The following were non-serious cases, but are mentioned here as requiring comment on account of the attendant circumstances:—

Henry Rowlands, single, aged 24 years, a shoveller on the floor of the office tunnel, was seated in Block "F2" having crib when a quantity of "side-ground" came away, and falling on his legs and back necessitated a week's idleness to recover. The selection of the set was most injudicious, and an order followed that no sets should be left before being properly secured.

James Cumming, married, aged 31 years, a riseman, working in a connection between "No. 1" level of the "balance" shaft and the "office" adit, sustained a scalp-wound that incapacitated him for a week. He had "spit" three holes, and while endeavouring to close a trap-door lost his light. In all probability he remained longer than he believed or intended, and a shot going off before he reached safety in the level, broke a staging-board that, with a portion of the overburden, fell upon him.

George Brooks, aged 25 years, a faceman, working in Block "3" stopes of the balance shaft, received slight bruises to his legs by a fall of clay from the face he was working, jamming him against the timber of the set below. He had only taken up the position for a moment, in order to clear the spoil that was accumulating and blocking his "rill," otherwise the injury could not have happened. He returned to work within a week.

Thomas Dillon, single, aged 28 years, was engaged on a windlass lowering timber from a crosscut in the "office" adit, when he sustained a slight fracture of the skull by being struck with the handle that he lost control of. He resumed work within a week. An investigation elicited the fact that the timber (a leg) caught, and then slipping away jerked the handle out of Dillon's hands, an occurrence that is most prevalent in this class of work, and that can only be guarded against by making it compulsory to have all windlasses mounted with pawls and ratchets.

Richard Lonsdale, single, aged 26 years, a shaft-sinker in the North Lyell Mine, was struck in the fleshy or back part of the right thigh while being pulled away from a round (7) of shots he and his mate had "spit" in the bottom of the main shaft. Three of the latter, according to the men's statement, exploded prematurely. Whether this was the case or not, fortunately needs no comment, beyond demonstrating the necessity of all precautions being taken in this branch of mining, particularly in the selection and use of fuse, which for shaft-sinking purposes should be specially prepared and its qualities guaranteed by its makers. Electricity is becoming so general that it will be well when, by regulation, its service is applied to shaft-sinking, and even now there is no valid reason why these mines that are installed should not extend its use for the purpose stated.

May Gold Mining Company, No Liability.—Thomas Hardman, a battery-feeder, single, aged 19 years, had the fingers of his right hand jammed between a revolving cam and a stamp-shank he was cleaning. The injuries were slight, but might have been otherwise, and demonstrates that unless required under exceptional circumstances, no dangerous part of any machinery should be cleaned while it is in motion.

The foregoing constitute the number of casualties that have come to my knowledge; others, such as bruises to hands and feet, chiefly fingers and toes, burns, and shocks, have taken place, but were not reported. With the operation of the new Mining Act, however, some of these will henceforth be included; while others that are now enumerated, unless attended with circumstances calling for remark, may be omitted.

In reviewing the whole of these accidents, it is satisfactory to note that apart from the flux-quarry fatality, no other serious accident has happened in the open-cut faces, which, considering the number of men employed and the quantities of material removed, is worth noticing; while an analysis of the fatal accidents demonstrates that if not all, certainly two, of them should not have happened: (1) Walch's action in knocking out the piece of taut timber in order to give more freedom to the shots he was about to fire, cost him his life; (2) where Ross was overcome would have assured most men of safety, but it was only after running some distance that he gained this spot. He warned others, and evidently only thought of his own safety when the mass was collapsing; (3) Kelly, in pursuing a custom that had become somewhat general with the haulage hands, contributed to his death by riding on loaded trucks, that was contrary to the company's regulations. Hence, had thoughtfulness on one hand and discipline on the other prevailed, those men might have been living still, and their untimely ends should be an object-lesson to all, and especially to young men, who are engaged in dangerous callings, to remember *that the greatest responsibility for their own welfare and safety rests with themselves.*

Magazines and Explosives.—Five are locally in use. Three belong to the Mount Lyell Company, and each carry an average stock of 10 tons of mechanical and chemical compounds. The monthly consumption of explosives on the field is between 5 and 6 tons. A grievous mistake is made in permitting any deleterious stuff to come into the State, and those responsible for its distribution should be subject to a severe penalty.

Shafts and Ladder-ways.—Those in daily use for "life" purposes are in good order. The balance shaft at the Blocks Mine became, for cage work, unworkable, but prior to this men were not permitted to ride through it. The main shaft of the same mine occasions attention, but beyond intermittent repairs and bailing, it is not used, and even for these purposes its use will in all probability cease when the main or "Consols" adit connects it.

Ropes and Cages.—In addition to periodical tests, close observation has been kept on those in use, and with one exception they can be returned as being all in first-class order. Miller's Tasmanian cage predominates, and were it mounted with a hand-lever, whereby it might be serviceably controlled by those riding in it, I have little hesitation in stating that it would come within the nearest approach of its intended purpose. Competent and careful enginedrivers, with nothing but the best ropes, governed by "life" limits, are, however, the best margin of safety to rely on.

Ventilation.—With the year just terminated, this has been good, but as depth is attained, and waiting connections with the preceding levels, it must necessarily require increased attention, and for that purpose, apart from anemometer readings, provision will have to be made whereby, in addition to quantity, the purity of the air may be ascertained. The recently-connected higher or stope workings with the "Consols" adit in the Blocks Mine have much improved these workings.

Inspections.—Inspections and other duties pertaining to this office have been attended to, as follows:—

Iron Blow, open-cut, surface, 41; underground, 5.
North Lyell, open-cut, surface, 41; underground, 39.
Lyell-Tharsis, open-cut, surface, 37; underground, 15.
Lyell Blocks, open-cut, surface, 40; underground, 44.
Flux Quarries, open-cut, surface, 27; underground, 0.
Fire-clay Face, open-cut, surface, 12; underground, 0.
Brick Kiln Face, open-cut, surface, 8; underground, 0.
Crown Lyell Mine, surface, 0; underground 5.
Tasman-Comstock Mine, surface, 0; underground, 2.
Tasman and Crown Lyell Extended, surface, 0; underground, 4.
Lake Jukes, surface, 0; underground, 3.
Coronation Gold Mine, surface, 0; underground, 5.
May Gold Mine, surface, 0; underground, 10.
Woody Hills Gold Mine, surface, 0; underground, 5.
Copper Mines, West Lyell, surface, 0; underground, 3.
Hyde's Show, surface, 1; underground, 0.
King River P.A., surface, 1; underground, 0.
Reduction Works, Smelters, 15.
Reduction Works, Concentrators, 8.
Reduction Works, Batteries, 7.
Ropes tested, underground, 12.
Cages tested, underground, 12.
Ropes examined, surface, 88; cages, 15.

Enquiries, 22; interviews, 11; Lands and Works Office, 5; magazines, 13; conference, 1; inquests, 3.

Conclusion.—The various mines that form the Mount Lyell group promise a continuance of advancement and prosperity during the ensuing year (1906). Prospecting continues on the South Contact from the "No. 8" level of the parent mine, also at the North Crown; while similar and developmental work is kept well ahead of the stopes and producing-faces at the Tharsis and North Lyell mines. The main shaft at the latter is some 480 feet below the lowest adit or 300-feet level. The odd feet are credited to the last "sink," that has passed through a continuance of high-grade copper ore. The Lyell Blocks Mine have advanced their main or "Consols" adit to a total of 1500 feet, and about this point connected with their higher workings 100 feet above. They are confronted with a difficulty in the shape of a surface-movement that, though slow, is ever increasing, and must prove menacing during the "life" or extraction of their more shallow workings. The value of this mine is centred in a clay channel, ranging from 20 to 100 feet in width, that assays up to 2 per cent. in the form of glance (Cu_2S) and native copper. It readily yields to puddling, and the residues are the chief sources of production. The latter is now about 87 tons of fine copper per month, with a promise of increasing.

Crown Lyell Mine.—One hundred feet were completed in the main shaft and the western "green" schists penetrated, but beyond maintaining the general characteristics of this belt of rock, nothing of importance was elicited.

Tasman and Crown Lyell Extended.—The winze on the large "sulphide" deposit was sunk 30 feet, but sufficient work was not done whereby its value could be ascertained, when the mine shut down pending a scheme of reconstruction that is still under way in Victoria.

Tasman-Comstock Consolidated.—Beyond prospecting on the western fall of Mt. Lyell, and a close scrutiny and sampling for purchasing purposes, no work has been done on this property for some time.

Copper Mines of the Mount Lyell West.—Prospecting has somewhat intermittently been carried on in the Razor-back tunnel, but without meeting with any success.

Lake Jukes Mining Company.—In an iron formation (principally hematite and magnetite), through the felsite, small bands and strings of glance and bornite, together with quartz, carry gold. To treat this a 5-head battery and water-wheel has been erected. The proposition, however, was hardly an amalgamation one, consequently, beyond establishing the presence of gold over a width of 16 feet, present appliances proved of little use as a final treatment of the ore, which will have to be subjected to more appropriate methods of extraction. For this, and the purpose of obtaining depth, increased capital is being solicited in the home market, from whence recent advice to the manager, Mr. H. S. Muir, is of an assuring character.

Coronation Gold Mine, Lynchford.—After persistent efforts in the "70-feet" level, operations ceased, and the plant is now being disposed of. An alluvial digger came across two large pieces of green-tinged stone that valued over 5 ozs. to the ton, but like similar loose boulders in the past, their source has evidently never been located.

May Gold Mine, Lynchford.—This company removed from Heemskirk and re-erected a five-head battery and water-wheel. They crushed 183 tons of stone for 35 ozs. of smelted gold, and are at present preparing another crushing that is expected to be more remunerative.

Woody Hills and Macquarie Mines have been persistently prospected by the Murray Bros. with a number of men, that still continue. The last crushing of 30 tons returned 12¼ ozs. of retorted gold.

Darwin.—The Thompson P.A., a co-operative syndicate from Gormanston, are prospecting the south-eastern spurs of the mountain, on a section where some heavy gold had been found by their prospector.

Alluvial diggers are also in evidence in this neighbourhood, Flannigan's Flat, Harris' Reward, Queen River Flats, and upper tributaries, but judging by the returns supplied by the banks and storekeepers, none are making fortunes. These grounds provide means of making a living, that there is little doubt will continue indefinitely. Many of these locations present favourable situations for suitable dredges which, according to interstate statistics, should pay handsomely.

Mr. T. B. Moore, the well-known West Coast explorer and prospector, is credited with taking up ground in the vicinity of "Dora" and "Red Hills" for a strong syndicate that is likely to test these properties.

Now that communication is made so much easier than in the early days, it is to be regretted that more attention is not given to the equipment of prospecting parties under the lead of capable and reliable men, who have better opportunities of rendering a good account of themselves than those who preceded them when the West Coast was practically unknown.

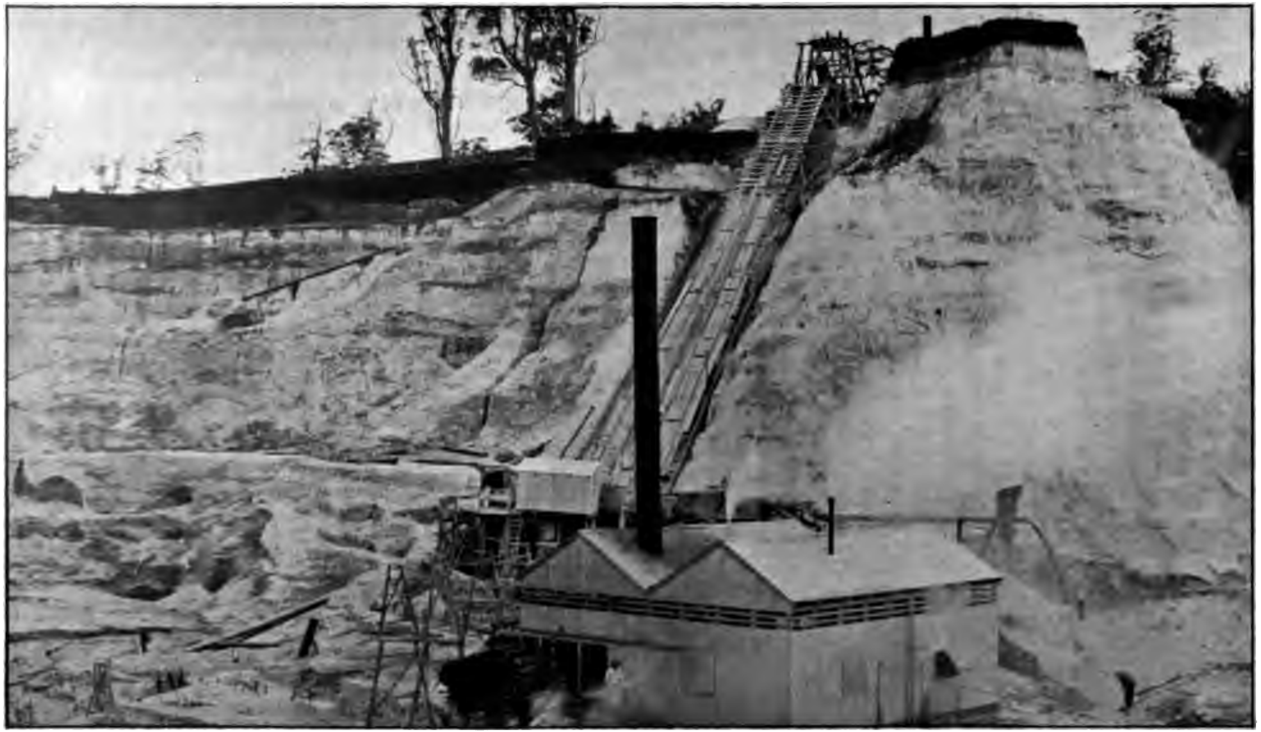
This Lyell District receives such little consideration from the Government in return for what it provides and gives, that I certainly think our Department would be justified in having a fund established whereby another exploring expedition, on lines similar to that of Gould's, could be revived, and its labours devoted to cutting tracks and opening up the country east of the metalliferous belt that continues through the intervening ranges between Darwin, Sorell, and Mount Farrell.

LIST of Accidents in Inspector Curtain's District for the 12 *months,* 1*st January to* 31*st December*, 1905.

Fatal, 3 ; non-fatal, 6 ; total, 9.

Date of Accident.	Name of Mine.	Locality.	Cause of Accident.	Name of Sufferer.	Married or Single.	Nature of Injuries.	Particulars.
1905. 19 Jan.	Mt. Lyell Blocks	Mt. Lyell	Fall of stone	Powell, Chas.	Single	Severe bruises	Was mullocking up second floor of a level, when some stone fell and knocked him down ; another piece then fell and struck him on thighs and groin, bruising him internally and both of his legs.
10 Feb.	Mt. Lyell M. and R.	Ditto	Ditto	Walsh, Alfred E.	Ditto	Fatal internal injuries	Was working in B stope, N. Lyell Mine. He knocked away a prop, and a slab of stone fell on him, killing him instantly.
18 Feb.	Ditto	Ditto	Runaway truck	Kelly, Wm. John	Ditto	Fracture of skull	Riding on truck on haulage line. The truck became detached from rope, and Kelly jumped off. When picked up his skull was found to be smashed in.
18 Feb.	Ditto	Ditto	Ditto	Rdzberg, Ernst Fredk.	Married	Fractured skull, bruises and cuts	Same accident as preceding.
14 June	Lake Jukes Copper	Mt. Jukes	Explosion of gelignite	Richards, Luke	Ditto	Loss of an eye, and cuts on face	Was working some rock after a round of shots had been fired ; his pick struck some unexploded gelignite, and an explosion took place. His eye was injured, and eventually he lost the sight of it.

17 Aug.	Mt. Lyell M. and R.	Mt. Lyell	Slip of earth	Ross, Rd. Dillon	Single	Suffocation	Working in flux quarries. A fall took place and buried him.
17 Sept.	Ditto	Ditto	Fall of launder	M'Lean, Donald	Ditto	Broken leg	Assisting to take back launders off furnace: the nut on last bolt came off, and the launder fell on him, causing compound fracture of right leg.
16 Dec.	Ditto	Ditto	Fall of timber	Frost, Henry Chas.	Married	Ditto	Withdrawing section of square-set timbers. Four sets had been removed, and the others collapsed, causing a compound fracture of right leg.
27 Dec.	Ditto	Ditto	Molten matte	Keating, Patk. John	Widower	Severe burns	Working as leverman at converters, and got splashed by molten matte.



Arba Tin Mine, Branxholm.

ON COAL AT MOUNT REX.

[One Map.]

Government Geologist's Office,
Launceston, 28th April, 1905.

SIR,

ACTING on your instructions, I proceeded to Mount Rex on the 16th ultimo, in order to examine the recently reported occurrence of coal in that district. A discovery of seams situate in the Parish of Malvern has been made by Mr. James Stevenson, at a distance of about ¾ mile south and south-east of the Mount Rex Tin Mine, and 5 miles north-west of Avoca in a direct line. A section of 160 acres, 201-M, has been taken up by Mr. James Stevenson, and mining rights have been acquired on the adjoining freehold of Mr. H. R. Falkiner, 3680 acres. The present way of approach to the field is along a fairly level road from Avoca, on the western side of the Castle Carey Rivulet for three or four miles, and then up the road to Mount Rex for a couple of miles, as far as the Black Pinch, when a turn to the south is taken just west of Mr. McCarthy's farm boundary. The journey can be easily made in one and a half or two hours from Avoca Railway Station. If the seams are developed, and a permanent coal-field springs up here, the outlet will be down the valley of Buffalo Creek to Avoca.

The Avoca township is on Tertiary basalt, and the road for some distance on the west side of the Esk River traverses Tertiary sediments. But further on, the Mesozoic trap-rock or diabase prevails, giving place to Permo-Carboniferous sandstones. The road up Mount Rex is on the western side of a valley which is along the contact of the sandstones and diabase on the west with the granite on the east. At the Black Pinch a diabase (greenstone) hill occurs to the west of the road, and at the southern end of this hill two seams of coal have been discovered in sandstones of Mesozoic age.

In Tasmania it is not practicable to divide Mesozoic strata in the same way as is usual in Europe; but these upper coal measures probably correspond as nearly as possible with the Jurassic or its equivalent in other parts of the world. In Tasmania they are everywhere pierced by eruptive diabase rock, which at the contact tends to make the coal brittle and hard. Owing to detritus, the actual contact is rarely seen, except where dykes traverse the sandstone, and the present position of the denuded eruptive mass at the crown of the ranges always impresses the casual observer with the idea that the sandstones with their associated coal seams pass beneath it. Without denying the possibility of this in certain cases, it must be said that its occurrence has not yet been demonstrated; while, on the other hand, several instances are known of coal measures being cut off by the trap-rock; and boreholes in the sandstone have frequently penetrated to the underlying trap.

At the south end of Greenstone Hill a drive has been put north-west into the hill for about 50 feet on a seam of coal said to be 6 or 7 feet thick. The approach has fallen in, and I could not examine the seam. I was told that it was soft at first, but developed into solid coal when further in. At surface loose stones of diabase greenstone are scattered through the soil. These have been derived from the hill higher up. I think it quite possible that in extending this tunnel, say, some 500 or 600 feet further the solid diabase would be met with, unless, of course, the sandstone passes beneath it, as mentioned above. The seam could, however, in any case be followed round the contour of the hill, and would yield a lot of coal, though my fear would be that, as it is apparently so near to where the diabase may be expected, it would never get much weight upon it.

Four or five chains south-west of this, and 90 or 100 feet lower, a 12-feet seam of coal has been discovered. This was the first discovery, and a drive was put in on the upper part of the seam for upwards of a chain; but it has fallen in, and I could not see this particular drive. However, a tunnel has been driven upon the seam a few yards to the west for a distance of 150 feet. This tunnel averages 10 feet in height by 6 feet in width. Its direction is 10° west of north; and the dip of the seam is to the west, at an angle of 10° from the horizontal. The level or drift has been carried horizontally across the dip of the beds, and the whole vertical thickness of the seam has been extracted from sole to roof. The seam is displayed well and continuously all along the drift for an average thickness of 10 feet. A hole which I had sunk in the floor about 20 feet behind the face showed the seam to within a few inches of 12 feet thick in all. I was told it had been measured to 12 feet. The section near the face and on the east wall of the level was as follows, in descending order: —

	ft.	in.
Coal	3	0
Band of white clay	0	6
Coal .... 5 inches to	0	6
Clay band	0	2
Coal	1	2
Band .... ½ inch to	0	1
Coal	1	9
Band, variable	0	0½
Coal	0	7
Thin band, inappreciable	—	
Coal	4	0
Total	11	9½

I could not examine the last foot or two of coal in section as the water drained into the hole sunk, but the quality was quite equal to that exposed in the level. In the face the two upper bands are coming together closer, being only 3 or 4 inches apart. On the west side of the level, too, the bands seem to be thinning, and some of the thinner ones have died out altogether. If there is any difference at all in the appearance of different parts of the seam, the lower part is the sounder; but all through the seam consists of solid, marketable coal. Inside the entrance to the level a peculiar occurrence is noticeable. The lower part of the seam is invaded by sandstone, leaving the upper 3 feet and band unaffected. The fact that the upper part is untouched proves that there has been no faulting or other disturbance, and I think the proper interpretation of it is that a roll or even a more decided unevenness or drop of the floor takes place at this point. It occurs at the entrance itself, and does not prejudice the part of the seam in which the level has been driven. Several tons of good quality coal are lying outside the mouth of the tunnel. Some of this heap has been used in the furnace at the Mt. Rex Mine.

The line of contact between the sandstone and diabase ahead of this tunnel is not visible, being concealed by detritus from the eruptive rock, which tends to make the contact seem nearer than it really is; but it is probable that after further 10 to 20 chains have been driven north the drive would be in the neighbourhood of the junction, and the much debated point of whether the coal measures pass below the diabase or not would be on a fair road to settlement.

About ½ mile further west, and 140 feet lower down, is a shaft which has been sunk on what appears to be the same seam outcropping at surface. Its section, in descending sequence, is:—

	ft.	in.
Coal	3	0
Clay band	0	4
Coal	0	9
Band	0	2
Coal	3	2
Band	0	1
Coal	0	6
Band	0	0½
Coal	3	7
Clay bottom	--	
Total	11	7½

It will be remarked that the main features of the seam correspond fairly well in both the tunnel and this pit, viz., 3 feet of top coal, 3 feet of coal in the middle of the seam, and nearly 4 feet in the bottom part. On the other hand, the seam in the pit is horizontal, while in the tunnel it is dipping at an angle of 10°; the difference may be due to local weighting, or the dip at the eastern end of the field may very well be caused by the strata there being at the edge of the basin where it ends against the granite range.

The first thing to be done in this field is to test the extension of the seam or seams; and having determined them to be continuous and free from faulting, a few tons should be got out and placed for practical trial. Then the matter of connecting the field with the Government railway can be taken in hand.

A sandstone flat occupies the valley between the two diabase-crowned ridges of Christie's Hill and the Greenstone Hill, but between the former and the flat there is a lower ridge of sandstone. The flat ground nowhere exceeds a height of 100 feet above the coal seam at the shaft, and is for the most part less than that, so that testing the seam in the valley even by means of shafts.

would be comparatively easy. It is not likely that much water trouble will be met with, as the underground drainage will follow the coal seam to its outcrop lower down the valley. A couple of shafts on an E-W line would be sufficient on the flat. To test the ground along the north side of the valley up on the southern flank of the hill, between the shaft and the tunnel, it would be best to resort to boring with a core drill; a heavy plant would not be required. The boring will be easy work, but some way of bringing water on the ground will have to be devised. While the drill is on the spot it might be advisable to put down a hole lower down the valley, to ascertain whether other seams do not exist below the present one, and in situations nearer to the Fingal Railway line.

The outlet for this coal-field will be down the valley of Buffalo Brook to Hanleth, on the Avoca-Conara line, and once production here is established there is no doubt that this, and not the Avoca route, will be the egress for Mt. Rex and Ben Lomond traffic. The distance to Hanleth station along a route which would be followed by a tram or railway-line has not been ascertained, but it is thought it will not exceed 7 miles, and most of this is easy grade. The steepest gradient will be shortly after leaving the mine. The height (barometric) of the coal shaft above Hanleth station is about 650 feet.*

From the felspathic nature of the sandstone, the thickness of the seams and quality of the coal, although so far I have seen no fossil plant impressions, I entertain no doubt that the seams belong to the upper coal measures in Tasmania, and indeed to the same great series of coal-bearing strata which flank Mt. Nicholas and other mountains in the eastern part of the island.

I had average samples of coal broken down from the upper and lower parts respectively of the seam in the tunnel; and these, assayed by the Government Analyst, Mr. W. F. Ward, gave the following results:—

	Fixed Carbon.	Volatile Matter.	Ash.	Sulphur.	Moisture.	Coke.
Upper part of Seam	54·5	35·0	8·5	0·8	1·2	Firm
Lower part of Seam	55·0	28·2	15·1	..	1·7	Firm

Mr. J. D. Millen, F.G.S., of the Mt. Bischoff Smelting Works, assayed a sample for Mr. Stevenson, the result of which I am permitted to quote. **For comparison I place these analyses in juxta-position with standard analyses of samples (taken by Mr. M. J. Griffin, Inspector of Mines) from the Mt. Nicholas and Cornwall seams; not,** however, with the intention of **saying anything depreciatory in respect of the coal from any colliery nor setting off one against the other, but to show that notwithstanding minor variations, which may exist even in different parts of the same seam, all of them belong to a series of** deposits which **must be considered as geologically identical.**

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* Determined with a Hicks' mercurial barometer.

	Fixed. Carbon.	Volatile Matter.	Ash.	Sulphur.	Moisture.	Coke.
Mt. Rex (J. D. Millen)	52·90	38·20	8·90	...	...	Good and firm. Gas properties profuse.
Mt. Rex (W. F. Ward)	54·50	35·00	8·50	0·80	1·20	Firm.
Mt. Rex ,,	55·00	28·20	15·10	...	1·70	Firm.
Cornwall ,,	55·00	31·02	9·56	0·56	3·66	No coherent coke.
Mt. Nicholas ,,	57·50	28·40	9·28	0·54	4·28	ditto

These analyses confirm the conclusions derived from geological considerations, which point to the Mt. Rex seams belonging to the same series as those on Mt. Nicholas. The Mt. Rex coal, however, forms a good firm coke in the laboratory, and the gases will in normal samples probably range from 35° to 38°. The proportion of ash in one of the samples is rather high, but may possibly be accounted for by some of the band material being included. Broadly, the coal contains about the same proportion of fixed carbon as the Nicholas varieties, but more volatile matter, and normally, I think, will be found to run about the same in ash.

Mr. Mark Ireland, manager of the Mt. Rex Tin Mine, reports that a trial of the coal was made at the mine, but that it was unfortunately mixed with bands. If the coal were delivered properly sorted, he says it would prove to be a good steaming coal.

An important feature in the analyses of this coal is its coking property. This, Mr. Arthur Green, Secretary of the Launceston Gas Co., informs me, has not yet been observed in the coal of the Mt. Nicholas series. If this property is maintained in larger tests, a very satisfactory fact will have been established. The percentage of sulphur present is less than that in the Greta, and some other of the New South Wales coals, and is also not so large as in many British gaseous bituminous coals. The percentage of volatile matter is sufficient for a gas coal, and with a few units more it would have made an excellent coal of that description: the deficiency in this respect is so slight, that it would be worth while submitting a sufficient quantity for trial. A few tons ought also to be got out and tried for steam purposes on the railway and on the river steamers. Greater confidence could be placed in the results of such trials than in conclusions drawn from a few analyses in the laboratory. But the analyses, as far as they go, decidedly support the opinion that the coal is of a quality well suited for both steam and domestic purposes. When tried even on an open hearth, I noticed that after a very little preliminary crackling, it burned freely and quietly, emitting considerable heat, coking visibly, and giving out a fair quantity of gas with a tolerably clean flame.

The discovery of this powerful seam at Mt. Rex is certainly geologically interesting, and may prove important even outside the question of its own economic value, for it indicates the possibility of the extension of coal-bearing strata still nearer to Conara. The diabase-topped hills which continue north of the railway westwards may carry coal-seams wherever these Mesozoic sandstones occur on their flanks. On the west side of Buffalo Brook, opposite the coal-shaft, I could see the precipitous diabase face of the range known as the Black Rock, but at that distance I could not identify any sandstones which might possibly be at its base. It is quite possible that the valleys indenting the broken country to the west may expose coal measures hitherto unsuspected.

Of one thing I am convinced, viz., that the possibilities of the country along the Fingal line with respect to coal are by no means exhausted by the known discoveries. The line runs through a large coal-field, which, though here and there interrupted by igneous rocks, contains numerous strong and persistent seams which are known at certain points, but which are also almost certainly existent in other parts of this extensive area. The local demand for coal is not yet sufficient to support the existence of large collieries in addition to those already at work, unless some advantage is offered in respect of quality or cost. But any improvement in these would result in increasing the present demand, and favourably affect the prospects of a shipping trade. Discoveries like that at Mt. Rex may be considered as tending in this direction.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES,
Government Geologist.

W. H. WALLACE, *Esq.*,
Secretary for Mines, Hobart.

SKETCH MAP OF M^T REX COAL-FIELD

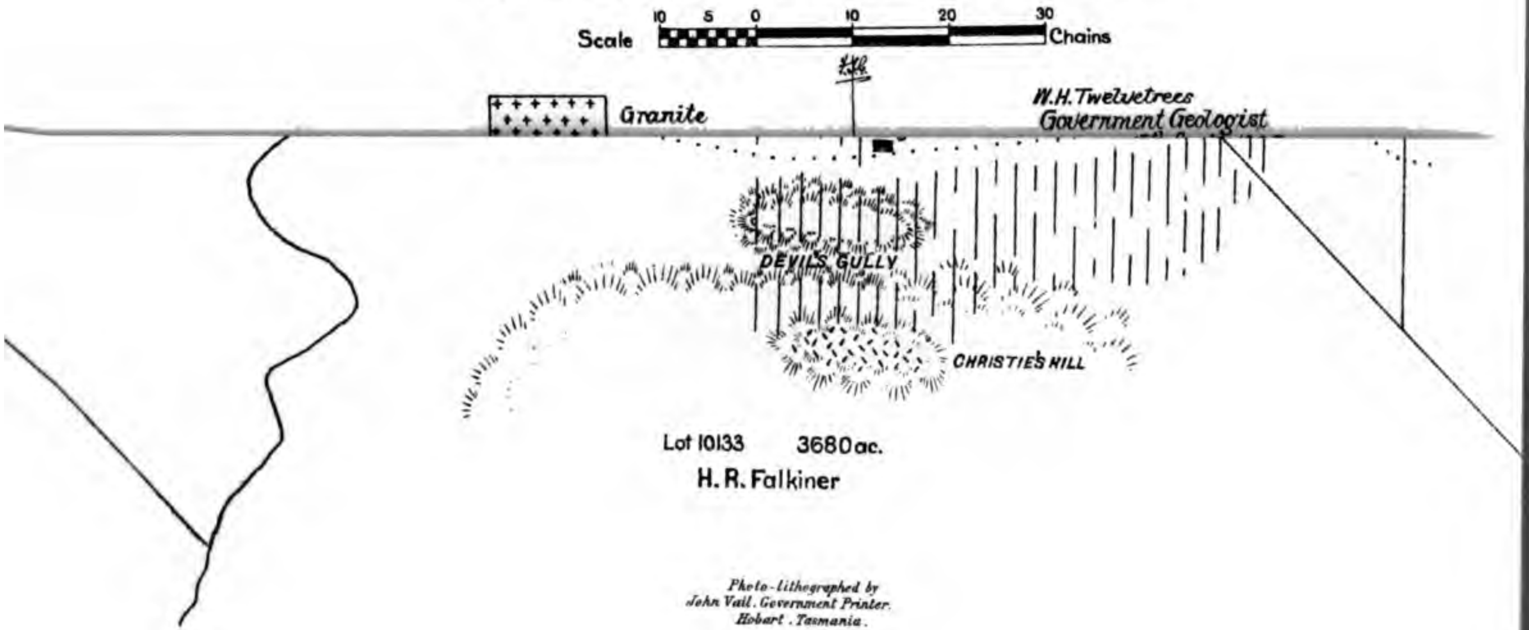
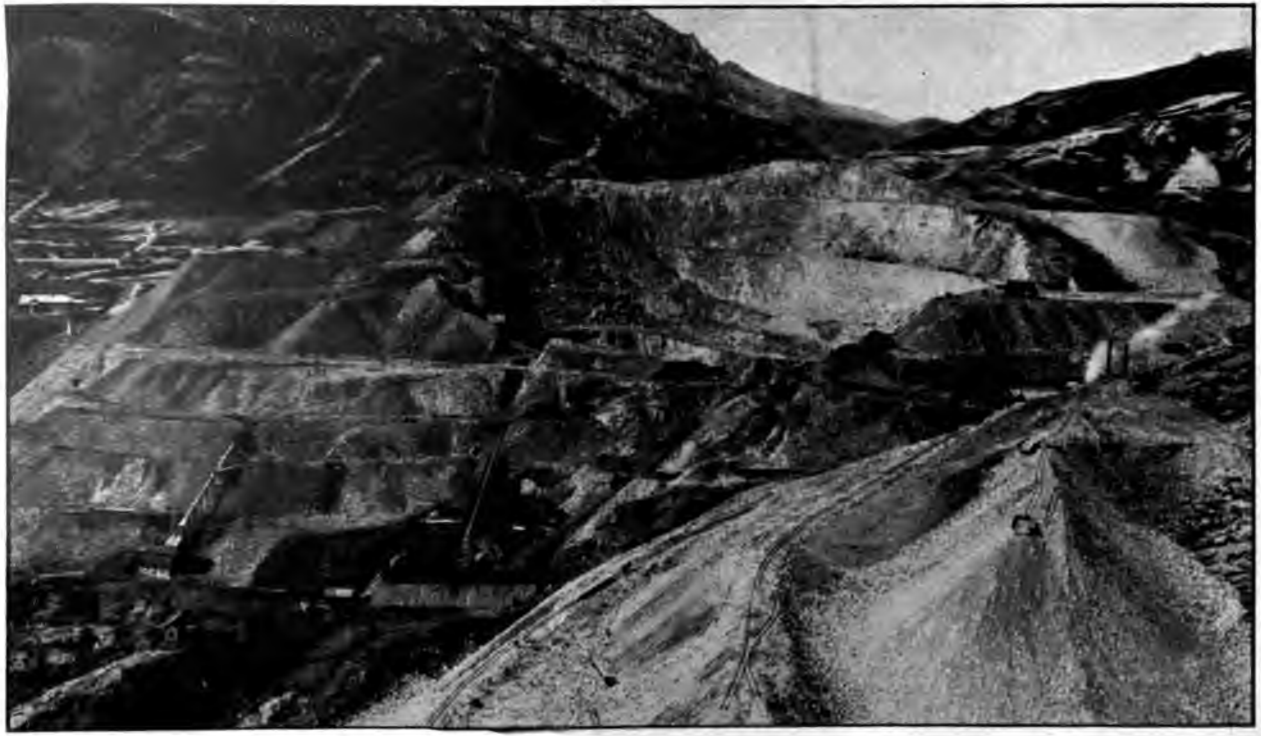


Photo-lithographed by
John Vail, Government Printer,
Hobart, Tasmania.



MOUNT LYELL COMPANY'S MINE.

REPORT ON NORTH-WEST COAST MINERAL DEPOSITS.

[Six Maps.]

Government Geologist's Office,
Launceston, 26th July, 1905.

SIR,

As instructed by you, I journeyed to the North-West Coast on the 10th January, and visited various mineral fields and occurrences of ore all along the coast, at the Forth, Penguin, Howth, Blythe, Stowport, Boat Harbour, and Rocky Cape. I returned to Launceston on the 10th February.

GEOLOGY.

This is far from being simple. The older rocks which are seen along the sea-shore are varied, sometimes metamorphosed beyond easy recognition, and disguised, too, by changes in colour and texture by the action of the atmosphere and sea-water. They comprise slate, quartzite, schist, conglomerate, sandstone, &c., penetrated in places by igneous rocks of granitoid, dioritic or gabbroid character, and often overlaid by basalt of Tertiary age.

The age of these ancient rocks is still unsettled, and is likely to remain so, as long as the stratigraphical succession is not elucidated by actual survey. Some of them may be Lower Silurian or Ordovician, others Cambrian, while crystalline and gneissoid schists, such as those in the Forth Valley and Inglis River, and quartzites, as at Rocky Cape and the Sisters, are probably Pre-Cambrian.

The oldest known fossiliferous strata in Tasmania are the friable yellow sandstone beds at Caroline Creek, between Railton and Latrobe, where Mr. Thos. Stephens, M.A., discovered trilobites, &c. (Dikelocephalus), characteristic of the Upper Cambrian; and a Dikelocephalus sandstone on the Tiger Range and elsewhere in the Florentine Valley, also discovered by the same acute observer, and referred by Mr. R. Etheridge, jun., to the Upper Cambrian. We have, therefore, in these Caroline Creek beds a definitely-known horizon, and a systematic survey would connect them stratigraphically with the strata on the coast, and enable a better idea to be formed of the age of the latter. Meantime, uncertainty exists as to which are Silurian, which Cambrian, and which Pre-Cambrian. The term Cambro-Silurian has been adopted in Tasmania as a temporary device, to avoid unjustifiable precision, but it is objectionable, as some of the strata designated by this name may be more ancient than the Cambrian.

Pre-Cambrian.—The Sisters' Hills and the Rocky Cape promontory are considered as probably belonging to this age. They consist of massively-bedded quartzite striking north-easterly and dipping north-westerly; at the Port the dip is north-easterly, and the strike north-westerly. West of the Port contorted quartz schists preserve the same dip and strike. The Rocky Cape hills run back from the sea for about seven miles to the main road, and continue southwards for another mile, when they sink rather abruptly to the level country. The quartzite of which they are composed is white and saccharoidal, not quite so dense in texture as that at Port Davey.

The schists and slate to the west are covered near Hellyer by deposits of recent sand and ferruginous drift. The country between Dallas and the Detention is occupied by cultivated basaltic soil. The junction of the quartzite with basalt along the main road between Detention and Boat Harbour appears to be at Mr. Moles' farm, half a mile east of Deep Creek.

At Boat Harbour the schists and quartzites may be considered as belonging to the same ancient series. The quartzite forming the promontory at the Penguin is also probably Pre-Cambrian, as well as other quartz schists which are visible along the coast-line. A gneissoid hornblende schist occurs in the valley of the Forth, a mile south of Hamilton, and must also be ranged among the Pre-Cambrian. This belt of rock strikes north-westerly, and from its direction would emerge on the coast in the neighbourhood of Clayton's Rivulet.

Cambro-Silurian.—These strata have been considered as filling an undetermined gap between the Pre-Cambrian and the Upper or Middle Silurian. They are supposed to include some of the slates which crop out between Burnie and Ulverstone, and are exposed in the gorges which score the basalt-covered plateau inland. Owing to synclines and anticlines, they alternate with the more ancient schists, and it is very difficult to unravel the succession. The term is susceptible of more than one interpretation. It might be used as denoting strata with organic remains characteristic of both the Silurian and Cambrian systems, as these are developed in the northern hemisphere; and as being equivalent to both these systems combined. Whether such an equivalence exists or not, cannot be affirmed, as no fossils have yet been found in these coastal beds. Or it might be taken as meaning a set of strata intermediate between Cambrian and Silurian, and filling the gap which is represented by the unconformity existing between the rocks of those systems in Europe. It is, however, employed here in neither sense, but simply as a cloak for ignorance. The data at our command are not sufficient to enable us to refer any of these rocks definitely, either to the Silurian or the Cambrian. Indeed, some of them may be Pre-Cambrian. It seems most likely that the work of future geologists will result in wresting many of these strata successively from their present provisional position, and adding them to the Pre-Cambrian division.

Eruptive Rocks.—Following the Silurian rocks in point of time are the igneous rocks of the coast (excepting basalt, which is much younger). These eruptive rocks are intimately associated with the occurrences of ore, so it is well to pay close attention to them. In time they occupy the interval between the Silurian and the Devonian. The conglomerates of the Dial Range are supposed to be Devonian, and (if we except provisionally the ill-understood breccia at the Neptune Mine) are not penetrated by the eruptives, or by any reefs proceeding from them; and they are singularly destitute of ores, excepting ores of iron. It is natural to suppose that the eruptive action took place before the conglomerate was laid down. The igneous rocks comprise gabbro, serpentine, basic diorite, syenite, granite, quartz-porphyry. These rocks are not widely separated in geological age, and throughout the whole of the north-western district they are associated with ores either of copper or lead. I have in another report* suggested the existence of a genetic relationship between our basic and acid rocks (gabbro and serpentine on the one hand, and granite on the other), a progressively decreasing basicity of the rock magma finally resulting in the formation of granite and reefs of quartz as the end term of the series. The deposition of copper apparently lasted throughout this process, as the ore occurs in connection with both the acid and basic rocks.

There is an exposure of serpentine about 200 feet wide on the west side of the Forth, half a mile south of Hamilton. A mass of quartz or felspar porphyry occurs higher up the same river, at the waterworks building. On the beach at the Blythe, opposite the railway station, is an intrusion of greenish gabbroid or dioritic rock into the quartzites, 100 feet in width, containing disseminated pyrite and copper pyrites. A somewhat similar rock crops out in the bay east of Cooee Creek and at Parsonage Point, West Burnie. At the Esplanade, west of Boat Harbour, a copper-bearing igneous rock of undetermined nature has intruded into the schist and quartzite for 150 feet in width. At J. Lee-Archer's copper mine a dyke of diorite, between 80 and 90 feet wide, in the Rocky Cape quartzite carries copper pyrites. At Hardstaff's mine, Dial Range, a copper-bearing quartz lode traverses granite; and at the Dial Creek group of mines pyrite and copper pyrites occur in the brecciated contact rock between granite porphyry and slate. The copper lode at Rutherford's mine, Stowport, is within a mile of the boundary of the granite running across the country east to Riana.

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* On the mineral resources of Beaconsfield, 1903, p. 54.

Devonian (?) Dial Range Conglomerate.—This formation comprises beds of cemented pebbles of quartz, quartzite, and jasperoid rock, lying horizontally or moderately inclined upon the ancient schists, and forming the bulk of the Dial Range. It apparently descends to the sea-beach east of the Penguin, for on examining the strata of the old Neptune Mine, I found an angular breccia lying horizontally on the older rocks. Near the summit of the range, the pebbles of the conglomerate are converted into hematite, and deposits of pure iron ore occur on Denney and Jones' sections. No mineral lodes have been discovered in the conglomerate, unless the uncertain case of the Neptune Mine is an instance.

Permo-Carboniferous.—The boulder clay or glacial till at Wynyard, with its embedded pebbles and blocks of rock, forms the base of the Permo-Carboniferous system. Granite blocks weighing several tons occur in this bed, which has been described by Messrs. Johnston, Stephens, Montgomery, Waller, and Kitson. Fossils derived from Middle and Upper Silurian strata are found in the pebbles of the conglomerate, and this indicates the existence of strata of that age in the back country. Such beds are known at the Heazlewood. This till is the basement on which the well-known fossiliferous Lower Eocene beds have been laid down. Permo-Carboniferous mudstones and sandstones occur along the coast east of Wynyard, and are known to the south at a distance of from 10 to 20 miles, where they enclose seams of excellent coal and kerosene shale (Preolenna). No mineral lodes need be sought in this formation.

Mesozoic Diabase.—This is known in Tasmania by its various field names of greenstone, bluestone, ironstone, or trap-rock, and is never absent from our coal fields. At Preolenna it crowns the high range between the Flowerdale and Jessie Rivers. No economic mineral has been discovered in it, but at its contact with the coal measure sandstones and shales in various parts of Tasmania, deposits of hematite and chalcedony have been formed.

Eocene.—This is represented at Sandy Cove Bluff, west of the mouth of the Inglis River, and consists of about 85 feet of limestone, charged with Eocene marine shells, resting on 3 or 4 feet of Eocene conglomerate. The lower part of this limestone for about 5 feet in thickness is characterised by its remains of Crassatella; over it for about 80 feet the rock carries Turritella and other shells, with leaves of dicotyledonous trees, and has yielded remains of a fossil marsupial. Seventy or 80 feet of Tertiary basalt overlie the whole. A catalogue of the shells has been recently published by Mr. Jno. Dennant and Mr. A. E. Kitson.[*] These beds are well known to Australian geologists, and visitors come to Wynyard from time to time for the purpose of seeing them.

Lower and Middle Tertiary.—Quartz gravel, or drift, in which a little gold occurs, is spread over the country at a height of 200 to 500 feet above sea-level, under a covering of basalt and basaltic soil, and protrudes from beneath the edges of this volcanic sheet, in the sides of the valleys which have been cut down by the creeks and rivers to and into the bed-rock. This drift is not really confined to the valleys, but caps the high land between them, where very often the basaltic cap has worn away and exposed the gravel and cement. The grit or gravel is often cemented with iron, derived from the overlying basalt, and concretionary iron ore (limonite) has formed in it, the whole bearing some resemblance to lode gossan, for which it is frequently mistaken. I had occasion several times in this journey to remove an impression that this sub-basaltic ferruginous cement or ironstone grit was the gossanous capping of lodes, *e.g.*, at Mr. Taylor's, Primrose Park (Howth), Mr. Smith's (at the Blythe), Mr. Bramich's (at the Blythe), and on the hill between the Blythe and Howth. Lignite and brown coal occur in this formation, with impressions of leaves of European trees, similar to those found in beds of similar age in the basins of the Tamar and Derwent, at Mt. Bischoff, Burnie, Strahan, &c.

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[*] (Rec. Geol. Surv., Vict., Vol. 1, Part 2, 1903.)

Heated solutions from the basalt have cemented the underlying drift into a hard quartz conglomerate at times, which is not always easily distinguishable from the older rocks in the neighbourhood. This may be seen on the hill on Mr. Bramich's section at the Blythe; and on the side of the hill on the western side of the Howth Valley, about 100 feet above sea-level, where cliffs about 25 feet in height expose a section of the conglomerate underneath a bed of coarse shingly wash. Caves are hollowed out in the softer portions of the formation at Howth. Gold has been found in these sub-basaltic gravels at different parts all along the coast, but so far no gutter has been located. The indications are those of a widespread sheet of gravel, rather than of beds of separate creeks or rivers. The fossil leaves and wood point to estuarine conditions. Still the uniformity of the deposit over such a wide area strongly suggests beach action. The coastal land at the time was evidently much lower than at present, and as it subsided, these drifts were laid down. At the same time, it is difficult to see how gutters could avoid being formed, running seaward; and if these can be found, there would be some hope of discovering payable wash.

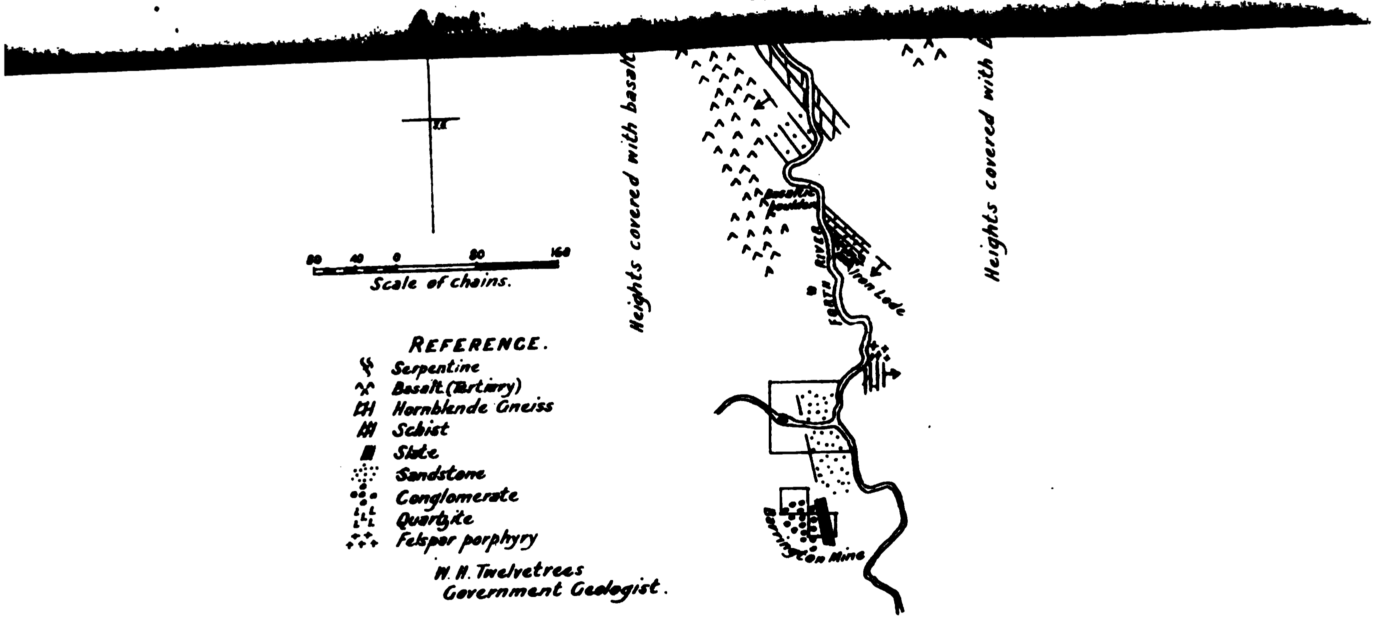
Creeks in the districts of Table Cape, Boat Harbour, and Rocky Cape contain zircons and sapphires. The source of these has not been discovered. They appear to have been proximately derived from the sub-basaltic drift, but their ultimate source is still a matter of conjecture.

Tertiary Basalt.—This covers the whole country for many miles back from the coast, forming a rich red soil—the so-called chocolate soil—on a plateau 400 to 500 feet above sea-level, and occasionally, as at Penguin, Burnie, and elsewhere, descending to the sea-beach. The solid basalt is seen in road-cuttings everywhere, softening and decomposing into the fertile soil for which the North-West Coast is so famous. At Burnie, near the pier, it is prolonged into the sea in the form of a pavement of hexagonal columns, a structure due, as is well known, to the contraction of the cooling rock.

The Table Cape Bluff, which is a promontory rising to a height of 600 feet above sea-level, is composed of a rather coarsely crystalline basalt, of somewhat sodic constitution.

It forms a striking object in the landscape, and is visible for a great distance along the coast. The adjacent township is Wynyard, at the mouth of the Inglis, in a thriving condition, and destined to improve as settlement progresses in the back country.

Geological Sketch Map of



John Vail, Government Printer, Tasmania.

Recent.—Beds of beach sand and pebbles at intervals along the sea-shore denote an elevation of the land in recent times. These are seen easily at the bridge over the Emu River and at the bridge over the Blythe, where (at the latter place) there must have been an elevation of from 40 to 50 feet. Recent sands extend inwards on the flat land at Emu Bay and Wynyard, and the gravels of this age also contain a little gold, but not payable.

To summarise the above remarks, and present the geological series in order of age, I append the following:—

Succession of the Geological Record.

RECENT AND LATE TERTIARY (NEOGENE).	Flat country along coast-line. Raised beach sands at Wivenhoe, Blythe, &c. Flats at Wynyard and on Calder-road.
MIDDLE TERTIARY.	Basalt sheet on high land at Forth, Ulverstone, Penguin, Blythe, Stowport, Burnie, Wynyard, Flowerdale, Boat Harbour, Detention. Promontories or bluffs of basalt at Table Cape and Circular Head.
LOWER TERTIARY.	Clays, sands, and gravels below basalt; exposed at Penguin (Pine-road), and on road near cemetery; at Howth, in creek on Mr. Taylor's farm; on hill west of Howth; on farms in Blythe district; below Burnie township (Wilson-street); Seabrook Creek, Mt. Hicks-road, Calder-road, Detention district, &c. Drift often cemented by deposition of iron, and becomes an ironstone cement and gossan, with bedded and concretionary brown iron ore. Sands frequently silicified and converted into quartzite and conglomerate (at the caves, Howth; Smith's and Bramich's mining sections, Blythe. Clays contain beds of brown coal and lignite, with leaf impressions (Howth, Blythe, Detention). Lower Eocene fossiliferous beds at Wynyard, Table Cape.

ROCKY CAPE DISTRICT.

The Rocky Cape hills form a high range, which is prolonged seawards as a bold promontory, building the eastern horn of a bay, of which the Circular Head peninsula is the western horn. The distance across this bay as the crow flies is 13 miles. The trigonometrical station is fixed on one of the summits of the range 2½ miles from the extreme point and 2 miles north of the post road at the post office in the surveyed township of Dallas (locally known as Detention). The basalt country covers the area to the south of the main road, between it and Detention River. North of the road the quartzite hills begin.

The usual sub-basaltic gravel and ironstone grit or cement occurs on the farms in the district. I visited Mr. H. Boy's farm, which I am told is the oldest in the locality. The land is an ironstone conglomerate, composed of grit and clay and concretionary iron oxide. I was shown the site of a well which had been sunk for 40 feet, down to pipeclay, which is a well-known sub-basaltic formation all over the island wherever a basaltic area obtains. A creek (Coal Creek) which flows through the property west and into the Detention River has a bed of quartz-sand, brought down from the ironstone cement formation. Zircons and occasional sapphires are found in the creek, and it was here that the late Mr. Jas. Smith found a large sapphire, which, I am told, realised £15. I may here mention that a creek on the east side of the farm, east of the road, also contains zircons (locally, rubies); as also another creek running northerly through the farm. I was told, too, that zircons have been found in a creek near Dallas'.

It seems pretty certain that these gems are lying in the drift which underlies the basalt, but whence they were originally derived is unknown. It may be assumed that they have come either from some of the granite or syenite in the back country, or from ancient zircon-bearing schists. About eight years ago some carbonaceous material was discovered in Coal Creek, and some work has been done upon it, with a view of proving the deposit, which is about 5 chains from the western boundary of the farm. A shaft has been sunk 40 feet in drab clay, some of it a little carbonaceous. Higher up the creek, a pit was sunk 10 feet in the carbonaceous formation, and is not yet through. The deposit is a bed of impure brown coal and lignite, similar in character to the other deposits of this material at other places on the coast. Its thickness has not been proved, and its precise value is an unknown quantity, but it is improbable that its heating power exceeds that of wood. To make the material marketable, it would have to be pressed and moulded into briquettes (steam or air-dried), the cost of which per ton at the mine might be anything between 10s. and 13s. per ton. The calorific power being so low, the article would only be suitable for domestic purposes, and the likelihood of its displacing wood or coal at present is very small.

Mr. Boys obligingly showed me over his farm, and gave me an opportunity of examining the geological features of this area. To the north, between here and the sea, the ironstone drift becomes overlaid by more recent sand.

Rocky Cape itself forms a small peninsula, the port being on the east side of the narrow isthmus. About 150 feet above the jetty a natural cave exists in the quartzite cliff, on the floor of which are shells; but I did not notice any chipped stones or traces of the handiwork of aboriginals.

On the beach west of the Cape, associated with contorted quartz schists, is an outcrop of light-green actinolite-rock. It is a finer-grained and much less fresh rock than the diorite dyke at Mr. Lee-Archer's mine, but it belongs to the same type, and might carry the same minerals.

At the north-eastern point of Rocky Cape a wide dyke of greenish rock was noticed by Mr. Thos. Stephens, M.A., forming a well-defined intrusion between walls of quartzite. This is an augite-felspar rock, of dioritic affinities, and though no hornblende or actinolite is observable in it, it also must probably be classed with the Lee-Archer dyke and the other intrusions in the quartzites.

Lee-Archer Copper Mine.

This is situate on the beach 3½ to 4 miles south-east of Rocky Cape port, in a broad dyke of eruptive rock which traverses the quartzite strata in a north and south direction, and runs out to sea. A steep gully leads down to it from the high land; the line of this ravine indicates the line of the dyke inland. The dyke rock may be best described as diorite.* The width of the dyke from wall to wall is 84 feet.

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*Composed of hornblende and plagioclase felspar. The hornblende is frequently changed to actinolite and asbestos A little epidote is present. Titanic and specular (micaceous) iron ore disseminated plentifully. No primary quartz.

Two shafts have been put down. The first was sunk in the dyke to a depth of about 30 feet, at 19 feet from the east wall. The stone broken is greenish-grey in colour, carrying disseminations of iron and magnetic iron pyrites, somewhat asbestiform in parts, and with a few blebs of bright copper pyrites. The joint planes of the rock show a facing of red hematite. I was informed that pieces of copper ore, as large as the tip of one's finger, had been found. Looking over the heap, however, I could not see that at this spot sufficient has been found as yet to drive upon.

Seventy-seven feet further north a small shaft, 5 feet by 4 feet, has been sunk to a depth of 40 feet, from the bottom of which a drive has been extended eastwards across the dyke for 25 feet. This was not accessible at the time of my visit. I was given some ore, stated to represent a seam met with in the drive, and this assayed 3·6 per cent. copper; as well as some stone from the last shot in the shaft, which assayed 2·3 per cent.; but though such results as these may be obtained here and there, workable ore has not been disclosed in these workings. Pieces of richer stone can also be got at surface, about low-water mark. The shaft has not been sunk lower than the level of low water, and the drive which has been commenced is too shallow to be of much use. The west wall of the dyke is formed by a reef of quartz 7 to 8 feet wide, and on the line of this the shaft was sunk. This quartz is laminated and white, and encloses in parts portions of the dyke converted into schist. This schistose rock appears to be the selvage of the dyke. Both quartz and schist contain iron and copper pyrites. The reef would seem to have been formed subsequent to the dyke, and the latter also is intersected by small veins of quartz. The copper ore appears to be mainly associated with the quartz, though the solid dyke rock is also impregnated here and there with this mineral. In the middle of the dyke is a band of carbonate of iron 3 to 4 feet thick, and it would be interesting to see what primary mineral exists below this in depth.

The dyke at present may be said to be entirely undeveloped, for the work done hitherto is too shallow to prove anything one way or the other. At the depths reached, nothing of any practical value has been discovered, for isolated pieces of pure copper ore scattered through a dyke like this are no more than mere indications of the existence of the metal. If it is desired to test the dyke in depth, and ascertain what underlies these surface signs, the shaft on the west side should be sunk at least a further hundred feet, a crosscut extended from it at that depth across the dyke, and a drive put in on the course of the quartz reef. Of course, such work would be entirely speculative, as there are no surface exposures of secondary ores indicating any quantity of primary ore below. Mr. Lee-Archer has, however, laid out a certain amount of money in the work which has been done, and is, I understand, desirous of seeing the test carried to a conclusion.

At about 100 feet above the mine on the west side of the gully is a cave in the quartzite cliff. Its floor is strewn with shells of edible molluscs, and the cavity was no doubt used at one time by the aborigines. The cave at the port, already mentioned, is of the same type. It is difficult to account for these cavities in such an insoluble rock as quartzite, unless by reason of some faulting action causing the beds to slide along their lamination planes.

Another description of cave is situate to the east round the headland, also about 100 feet above the sea. This one is in sandstone, and is always full of drainage or spring water. I was told that dry seasons do not make much difference in the level of the water. It has a low roof at entrance, but inside is about 20 feet high. The sandstone is pure white, and soft. At the time only Permo-Carboniferous measures occurred to me, but I have since wondered whether the deposit is not of Tertiary age. This overlooks the Sisters' Bay, on the beach of which is some graphitic schist with disseminations of iron and copper pyrites.

Brakey's Show.

At Mr. Chas. Brakey's farm, 2 miles south-west from the above, either inside the northern boundary or on the Crown land outside (which, is not certain), is a mineralised outcrop of igneous rock. The rock is greenish, much decomposed, but some ill-preserved felspars can just be identified in it, and it must be either dioritic or granitic. It is traversed by seams of iron oxide, carrying a little copper pyrites. A cutting has been put into the bank of the creek, but the strike of the formation has not been disclosed, nor can anything further be said about it at present. It is probably one of the igneous intrusions which run out seawards, but it is over a mile to the west of the line of the Lee-Archer dyke.

Detention Quartz Reef.

Past Dallas', and north of the road, is a reef on which some work has been done, but a thunderstorm prevented my visiting it when passing. Some quartz runs across the road, and I was told it was considered likely to be the continuation of the reef. The samples which I took from this did not contain gold, but I am informed that a little has been found in the reef. The country is one in which mineral may very well be found, but prospecting has been very imperfect. The strata belong to the most ancient in the island, and the numerous occurrences of eruptive rock in the district are favourable indications for the existence of mineral deposits. So far, nothing very decisive has been discovered here in the old quartzites and schists; but quartz veins are not uncommon, and traces of gold and silver in pyrites and small quantities of copper have been obtained. The quartzite is coarsely laminated, and is not characterised by the minute folding found in so many of the West Coast strata, and which doubtless greatly assisted the infiltrations of ore solutions and the replacement of the country-rock by ore. So far as the quartzite, by reason of its hardness, resisted the folding process, to that extent it would be less prepared for the access of mineral in solution, and the quartzite areas consequently would not be very encouraging for prospectors. But it must be borne in mind that prospecting here has been very superficial; and while there are close at hand the igneous rocks, the sources of all our metals, a discovery of payable ore may be made any day.

The Rocky Cape quartzites have not been traced definitely far south; not more than a mile south of the main road. They there enter the geologically unknown country which extends south across the Arthur River to the Heazlewood and Long Plain. The quartz schists of the latter resemble those west of Rocky Cape, and are on the same strike. The Rocky Cape quartzites bear in the direction of the Heazlewood. They are not seen there, but may have been obliterated by the intrusion of the Heazlewood igneous rocks. The Arthur River country is practically *terra incognita.* Prospectors have penetrated it from time to time, and reported discoveries of mineral; but there is a great area of 50 miles by 20, on which no authoritative reports exist, and which may in the future contribute largely to our mineral output. Tracks through it exist on paper, but some of these, disused for a long time, are no longer practicable.

JACOB'S BOAT HARBOUR.

The Rocky Cape series of quartzites and schists extend eastwards to here. At the Town Reserve, the land overlooking the sea is 300 feet above tide-level. The dark-red soil of the thriving farms of the district indicates the existence of the basaltic sheet; but the underlying ancient rocks are seen in the face of the sea-cliff.

King's Mine, at Esplanade.

The discovery of some copper in the rocks on the sea-beach a mile west of the promontory overlooking the harbour was made about six years ago. There is here an intrusive dyke intersecting the quartzite for about 150 feet in width. The rock is greenish in tint, actinolitic in character, much decomposed, carrying a little pyrites, specular iron, asbestos, and copper pyrites. Only two or three shots have been put into it so far. I was informed that the best exposures are to be seen at low tide, and was shown some clean copper pyrites, said to have been obtained from that part of the dyke. My samples of specimens assayed 2·2 per cent. copper. The dyke has a direction of N.E.-S.W., and the quartzite here runs north-westerly, with a north-easterly dip. Veins of quartz traverse the eruptive rock, principally on its eastern side. The best way of testing the formation is to go up the bank some 20 feet, and sink on the strike, say, 150 feet or upwards, and crosscut the dyke at that depth. A discouraging feature is the absence of secondary copper ores at surface; this contra-indicates the occurrence of much copper pyrites lower down. The dyke belongs to the Rocky Cape series of intrusions; these are identical in geological age, and if good ore can be established in one of them, there is a chance for the others.

King's Schist Show.

Half a mile further west, and a mile east of the Sisters' Cape, at the base of the cliff on the sea-front, quartz schist is exposed, with some veins of quartz 2 to 6 inches in width, containing a little copper pyrites and specular iron. These veins are lenticular, and conformable with the laminations of the schist. A few yards further west the quartz schist is accompanied by an argillaceous variety, studded with iron pyrites and specular iron ore, and stained with the oxidation of iron. I could not detect any free gold in the samples taken, but if the discoverer wishes to test the formation, it is easy to drive into the hill, though there is not any great inducement. The eastern exposure is the better one of the two, but it is only a collection of small quartz lenses through 6 or 7 feet of country. As shown in the face of the hill, it is of no value, but a drive on its course would show whether any improvement is likely. These indications of mineral are poor things compared with those displayed by outcrops on the West Coast, but it would be unwise to positively reject them as unworthy of any attention, considering how little we know of the mineral contents of the ancient strata along this part of the coast.

Shekleton Zircon Deposits.

South of the town reserve at Jacob's Boat Harbour, and about ¾ mile from the sea, the land forms a saddle, from which a small creek flows northwards into Bass' Straits. A few zircons, or rubies, as they are called locally, have been found in the bed of the creek. From this saddle two or three zircon-bearing creeks flow south into the Shekleton Zircon Creek, which rises in the quartzite hills of the Sisters' and falls into the Flowerdale River further east. A couple of small zircon-bearing creeks also join the latter creek from the south. Mr. R. L. Skinner obtained a lease for zircon and corundum in March, 1889, which was transferred to the Shekleton Mining Syndicate, No Liability, in November, 1899.

The bed of the creeks consists of quartz and quartzite wash, evidently derived from the neighbouring hills and from the underlying bed-rock. Stones of basalt occur in it, and these have no doubt come from the overlying basaltic sheet on the farm lands. But the creek gravel is not basaltic in any way. It carries no inconsiderable quantity of small red and reddish zircons, with occasional sapphires. A good many of these gems preserve, roughly, their crystal form, but all are worn smooth, much smoother than the grains of quartz which accompany them. This, considering the superior hardness of zircon, points to an origin more distant than the Sisters' quartzite; and yet there is none of the granitic quartz which is usually found in the sub-basaltic gravels along this coast. Grains of black mineral resembling pleonaste are abundant in the sand, and there are also grains of a dark-brown mineral with conchoidal fracture and vitreous lustre, which, judging from Mr. W. H. Gaze's analysis, might be pyrochlore, or some mineral related to it. If this determination is correct, it complicates matters, and tends to make the origin still more obscure, as pyrochlore has only been recorded from elaeolite-syenite, which is a rock that has not yet been discovered in the north of the island. Mr. Gaze's published analysis is as follows:—*

Nitrate of uranium and chromium, a variety of pyrochlose:—

	Per cent.		Per cent.
Uranium	5·0	to	0·5
Chromium	10·5	to	12·5
Titanium	12·0	to	13·0
Niobium	4·5	to	2·5
Iron	25·5	to	27·7
Magnesium	2·2	to	0·5
Alumina	7·3	to	6·2
Lime	2·6	to	1·5
Silica	15·0	to	12·0
Didymium	7·5	to	0·5
Lanthanum	6·2	to	2·2
Thorium	1·0	to	traces
Yttrium	1·5	to	traces

In 1896 a ton or two of washed sand was exported to Melbourne, and some was sent to Europe, as it was thought that the zirconia and thoria might be utilised in the manufacture of the Welsbach gas mantles, which, as is well known, are made by saturating a cotton fabric in a solution of salts of some of the rare earths and metals, and then burning off the organic matter, so as to replace it by the metallic oxides. First, Welsbach used zirconia and lanthanum in equal proportions; then he found that by replacing zirconia by thoria he could increase the resisting power of the mantle. It seems, however, that the great improvement in modern mantles has been brought about by using small quantities of ceria with thoria: practically in the proportion of 1 per cent. ceria and 99 per cent. thoria. Curiously enough, pure thoria and pure ceria separately are valueless as light-producers, but the slightest addition of ceria makes all the difference.

The European trials of the Shekleton material did not disclose sufficient thoria contents for economic purposes, and work ceased on the claim. For some time after, however, search was made for specimens of corundum and zircon sufficiently large to sell as gem stones. Some were found large enough to cut, but the sapphires are generally fractured. The wash is from a few inches to a foot in depth. Mr. King, jun., kindly piloted me along the creek in very bad weather. The bed of the stream is greatly choked by growing timber and fallen logs, so that examination is difficult. There is no doubt, however, that the zircons are abundant, and it is quite possible that, with some unforeseen turn of the market, the deposit may eventually prove valuable.

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* *Mining Standard*, Oct. 8, 1896, p. 1373.

Reverting for a moment to the question of origin, the presence of zircons and sapphires in creeks at Detention, and also south of Wynyard in a creek falling into the Inglis, indicates a wide distribution. For the present, we seem unable to say more than that they occur in drift of early Tertiary age, generally in drift which has at some time been capped by overlying basalt. Their original source must have been some more ancient rock, which cannot yet be identified. Although at Boat Harbour I could not see much sub-basaltic grit or cement, such as is so prevalent elsewhere on the farms, it is very possible that a good deal has been denuded, together with the basalt, towards the Sisters', at some time or other.

TABLE CAPE DISTRICT.

Having visited the back country on a previous occasion to within a few miles of the Arthur River, I did not go up country again this time. The flat land round Wynyard carries gravel deposits of late Tertiary and Recent age. Though these contain a little gold, there is not much reason for believing that they will ever be found to pay for working. On the other hand, the gravels which are now or at any time have been sub-basaltic, and which are of early Tertiary age, are sensibly auriferous, and have been worked for gold all along this coast at Big Creek, Camp Creek, Seabrook Creek, &c. Heavy gold has been found in numerous branch creeks and gullies. It is extremely probable that auriferous leads exist beneath the basaltic sheet, and that gutters might be found by driving into some of the hill ridges below the basalt. Possibly, such gutters, where struck, would not prove payable, but exploratory work would disclose their direction and enable them to be traced and tapped further inland, where the gold might be expected to be heavier. A lot of unremunerative work has been done in the district, with the result, I believe, that the real leads have not been discovered, and workers have only been operating on gravels which have been widely distributed by the action of the sea, and cannot therefore be expected to be rich. But below this distributed material, there are almost certainly hidden and buried gutters, in which, judging from analogy and from actual indications, gold will be found in more concentrated deposits.

While in the district I was told of tin being found up the Inglis River, and also at the Cam. The probability is that the occurrences are in the early Tertiary gravels, but as granite rock is only found at a great distance inland, it is not likely that stream-tin will be at all plentiful. Some granite is rumoured to exist somewhere west of the Inglis, and I am trying to verify this.

But the country behind Wynyard, as far back as the Arthur River, is, once the basalt is left, dominantly a coal measure area; and these measures also extend below the basaltic covering.

PREOLENNA COAL FIELD.

This is about 17 miles south from Wynyard, and com prises the country between the Jessie and Flowerdale Rivers. Seams have been opened on the Jessie Fall by the North-West Coal and Shale Company, disclosing kerosene shale and a high-class gas coal, superior to anything yet found in Tasmania. The seams are not thick, being from 20 inches to 3½ feet. They occur in sandstones, which rest on and are overlaid by the fossiliferous mudstones characteristic of the Permo-Carboniferous system in Tasmania. The seams belong therefore to the lower coal measures. Above these, in the western part of the field, are seams of poorer quality, which occupy high positions in the Preolenna system, and may belong to the Mesozoic series, but no evidence from fossil plants is yet available in support of this view or to the contrary. The Launceston Gas Company has tested the illuminating power of the gas from the Preolenna shale, and found it to be about double that from Greta coal. The superior bituminous coal yielded 12,030 cubic feet of gas per ton, which compares well with the best N.S.W. coal used here. The yield from the latter is about 11,000 cubic feet per ton, but generally works out in practice at 10,500 cubic feet. The following analyses of samples which I took from the various outcrops in 1903 may prove of interest. The assays were made in the

Government laboratories by Mr. W. F. Ward, Government Analyst:—

	Fixed Carbon.	Gases, &c.	Ash.	Moisture.	Coke.
Shale from tunnel	21·00	76·20	2·30	0·50	Rather tender
Shale from cliff outcrop	23·20	71·60	4·10	1·10	Fairly firm
IX-mile 18-inch seam ...	52·50	41·10	5·50	0·90	Ditto
Fault Creek, north fork	52·30	41·70	5·00	1·00	Tender
Fault Creek	45·70	43·40	9·70	1·20	Crumbly
Fenestella Creek, 20 in.	46 90	45·90	6·50	0·70	Ditto
Ditto, 3 ft. 5 in......	44·40	50·30	4·90	0·40	Tender
Camp upper seam, 18 in.	44·40	48·30	6·60	0·70	Crumbly
Camp lower seam, 20 in.	46·90	44·20	7·10	1·80	Tender
Camp seam, N.E. Creek, south fork, 13 in.	45·70	42·00	10·70	1·60	Fairly firm

As the district develops, transport facilities will be brought within easier reach, and eventually these seams will form a valuable property. For the present, the only work which can be rationally undertaken is that of testing the seams in advance of the outcrops by two or three bores with a core drill. Freedom from faults would be ascertained in this way, and possibly some even better seams might be proved to exist below the known ones. The seams most likely extend to the north, and the country ought to be explored in that direction, so as to tap the coal nearer to the coast. A discovery has quite lately been reported between Camp and Seabrook Creeks, east of Preolenna, and nearer the sea. I anticipate that more seams will be disclosed in this district in the future, and I would urge continuous search. Unless Mesozoic measures are discovered, the seams are not likely to be thicker than those already known, judging from the analogy of the seams in the Mersey basin, which is of the same geological age, and in which the 10 and 12 feet seams of the Mesozoic measures do not appear to occur. The quality of the coal in the Wynyard district, however, is unsurpassed in Tasmania. The shale is identical with the so-called "cannel" coal of Barn Bluff. Both Mr. Thos. Stephens, M.A., and Mr. A. Montgomery, M.A., mention the occurrence of shale similar to that of Barn Bluff on the sea-beach at Wynyard, and in the Inglis River and in Seabrook Creek. I was able to verify this independently, and all this serves to strengthen the supposition that shale and coal seams still remain to be found much nearer the coast than Preolenna.

COOEE CREEK.

East of Cooee Creek, about a mile west of Burnie, is a broad bay, with sandy beach, through which protrudes an intrusive igneous rock, of dark-greenish hue and coarse gabbroid texture. Its constituent minerals are augite, hornblende or actinolite, and felspar, and it may be classed with the other dioritic dyke rocks which have been mentioned above as occurring along the coast. Disseminated through its substance are crystals of pyrite and a little copper pyrite here and there. An intrusion of a similar rock occurs at Parsonage Point, West Burnie, and the same rock may be seen at one or two other points between there and Cooee Creek. Although these rocks contain copper pyrites sporadically, there are no indications of ore-concentrations being present in payable quantities.

STOWPORT COPPER FIELD.

This field embraces the country between the Emu and Blythe Rivers, a plateau about 500 feet above sea-level, cut down into by Chasm Creek, which is a rivulet falling into the sea between Wivenhoe and Heybridge. The township of Wivenhoe is in the delta of the Emu River. The strip of land along the sea-shore for half a mile on each side of the mouth of the Emu consists of recent sands, covering most probably clays and gravels of Tertiary age. The latter occur in the township of Burnie, with characteristic fossil imprints of leaves.* On the east bank of the Emu mouth are boulders of hard quartz conglomerate. What formation these really belong to is somewhat uncertain, but I am inclined to refer them to the Tertiary system, and specifically to the highly siliceous conglomerates which are found below the basaltic sheet. The loose crystalline sandstone, which is scattered in tabular blocks over the beach at Burnie, appears to belong to the same series. Boulders of manganiferous iron ore at the mouth of the Emu River are also probably of Tertiary age. They form a confused mass of ferro-manganese gossan, running in a north-easterly direction, and prolonged to the eastern side of the river. They are embedded in the sand, but a close examination shows that the gossan is most probably a modification of the conglomerate just referred to. A hundred yards further west are embedded boulders of highly crystalline and siliceous sandstone, which, according to the theory now suggested, is a part of the same series of strata. The manganese formation has been sunk on for gold, of which traces are said to have been found. My samples, assayed by Mr. W. F. Ward, Government Analyst, returned nil.

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* Some of these, obtained in sinking a well in Wilson-street, were sent to the Victoria Museum, Launceston, by Mr. R. S. Sanderson, several years ago.

Towards the west end of Emu Bay the underlying Cambro-Silurian slates and quartzites crop out on the beach, striking north-easterly and dipping north-westerly. At the breakwater these are covered with basalt, which here has a pronounced columnar structure, and runs out seawards. At the eastern end of the bay the road to Stowport winds up the hill to a height of 450 feet before reaching the chocolate basaltic soil of the farm lands. The road shows the hill to consist of a succession of mica schist, quartzites, slate, and sandstone, with a north-easterly strike. There is an anticline in this hill, the western strata having a north-westerly dip, the easterly a south-easterly dip. The lower part of the road, about 500 yards from the Wivenhoe railway station, exposes dark micaceous and quartzose schists, which, for about 80 feet, are strongly seamed with quartz. An excavation has been made in a ferruginous bank by the road-side, where the soil is red, and has the appearance of covering a lode. This is opposite the sawmill.

These ancient rocks, when the brow of the hill is reached, near Mr. Norton's house, are covered with a capping of decomposing basalt and soil derived from it for a distance of 4 to 5 miles, when they again appear as the Rutherford mining property is approached. A mile south of the Rutherford Mine, the edge of the granite is reached, which stretches across the country east to Riana.

The Emu River has cut down first through the basalt, then through the underlying gravels and clays with their seams of lignite and brown coal, and into the underlying Cambro-Silurian slate and schist. The various creeks on the basaltic plateau frequently show the older rocks coming out from below the edge of the volcanic sheet.

Mr. W. Rutherford showed me an exposure of the subbasaltic clays on his 92-acre lot east of the Emu River, 250 feet above sea-level, on a small creek which flows into Glance Creek. Mr. Rutherford has sunk a small hole 7 feet through brown coal or carbonaceous clay into underlying sand or gravel composed of small beach stones. This black outcrop has been noticed for a distance of 45 or 50 feet. At other points, pipe-clay or a drab sandy clay has been met with under a foot or two of the brown coal.

The overlying basalt along the east side of the Emu Valley forms a capping of from 50 to 100 feet in thickness. The farms on this land yield splendid crops of potatoes and oats. Wheat is grown here and there, but does not thrive like oats; and either the soil or the position is not the best for fruit. I was informed that a fair yield for potatoes is 5 to 6 tons per acre, and a good yield, from 8 to 10 tons. For oats the yield ranges from 50 to 60 bushels up to 80 bushels per acre. This rich agricultural land, lying side by side with a mineral zone in the same area, forms an ideal district for both industries.

At about 6 or 7 miles from the coast, the slate strata are more or less strongly impregnated with iron and copper pyrites for a width of a couple of miles from east to west, at intervals. The strata here have a north-easterly strike. In the western part of the field, at the Norton-Tattersall property, they dip to the south-east; in the eastern part, at the Rutherford Mine, the dip is in the same direction. Between the two properties mentioned, on the banks of Chasm Creek, on Mr. Edward Gee's land (formerly J. Griffith, 107 acres), the slate is impregnated with iron pyrites, but, judging from samples shown to me, there is nothing at present to warrant any expenditure on discoveries made, though this does not discourage search for something better, which possibly may be found.

Norton-Tattersall P.A.

On Mr. J. Laxton's 50 acres east of the Emu River a zone or belt of slate and sandstone, heavily charged with iron pyrites, runs N. 25° E., dipping south-easterly, and some work has been done on this, with the view of proving it, and if satisfactory, of developing the formation. A tunnel has been driven into the hill for 90 feet. After driving 56 feet through slate, the mineralised slate and sandstone strata were driven into a distance of 34 feet. These are veined with quartz, and heavily charged with iron pyrites. Here and there a little copper has been observed, but the samples which I took in the tunnel yielded, according to the Government Analyst, negative results for gold, silver, or copper.

The strike of the formation would take it into Crown land, as well as into Mr. J. Laxton's 147 acres further north, and copper ore may occur somewhere along its course, but the absence of this mineral in the tunnel discourages further work at this spot.

In the creek, between here and the farm, there are two occurrences of graphitic slate. At the lower place it has been exposed by a cut in the side of the bank, showing graphitic slate and quartz intermixed. Higher up, within 50 feet of the brow of the hill, 4 or 5 feet of graphitic material is seen in the bed of the stream. Being softened from exposure to water, the occurrence was difficult to examine. The Government Analyst's assay disclosed poor results for graphite (carbon). Two years ago half a ton was got out, and it is reported to have realised £3 per ton. The present exposure of this slate is insufficient for any estimate of the extent of graphitisation, but a great improvement will have to take place for anything profitable to ensue. The history of graphite mining elsewhere in the world is replete with examples of unprofitable and abandoned mines, with deposits of only 10 per cent. to 20 per cent. carbon contents. If it is wished to test this occurrence, and to ascertain the average quality of the bulk, the creek should be diverted and the seam excavated sufficiently for the purpose.

Rutherford Copper Mine.

The Rutherford Copper Mining Company's mine is on Section 4496-93M, 60 acres, and purchased land 120 acres, F. C. Groom; with continuation of the lode south into T. S. Rutherford's purchased 320 acres. It has now been discovered about five years. A tunnel was first driven into the hill some 150 feet, intersecting a small copper lode near the entrance. This was then sunk upon, and drives opened on its course at 16 feet and 32 feet. The lode proved to be of varying width, 1 foot, 1½ foot to 2 or even 3 feet. The ruling width is 1 foot or 18 inches. When I was there, foul air prevented me from entering these workings, which up to recently had been worked on tribute, 70 tons of ore having been raised, with recoverable metallic contents worth £4 9s. 2d. net per ton after making smelters' percentage deductions. In addition to about 7 per cent. copper, the ore carries 3½ ozs. silver per ton.

A site has been chosen for a main shaft, and this has been sunk 99 feet. At 95 feet a crosscut was being started for the lode, and it was estimated that this would be cut in 50 or 60 feet.

The ore at the 16-feet and 32-feet levels is in the oxidised zone, and consists of copper pyrites and black oxide of copper in a silicified slate gangue. The lode strikes N. 40° E., and dips north-westerly. About 5 chains west is a belt of ironstone 4 chains in width. This is good hematite ore, containing 53 to 58 per cent. iron, 2 per cent. to 5 per cent. silica, and 0·5 per cent. phosphorus. South-east of the mine is a long belt of iron ore passing through Section 960M, 48 acres, G. F. Jewkes, and a good distance through T. S. Rutherford's 320 acres, where the outcrop forms a hill several chains in length and about 10 chains in width. The iron lode is bordered on the west by quartzite (locally known as porphyry), and metamorphic slate forms the country intervening between the latter and the copper lode. I followed the iron formation to within about half a mile of the granite country which comes in on the south of the 320 acres. The close proximity of granite suggests strongly a causal relationship between it and the iron lode. The copper ore deposit, too, may be regarded as having a similar origin. Finding good copper ore here with a strong iron lode as a near companion, the indication is that elsewhere along the same strike where there is a good development of iron ore, copper ore will be found in its vicinity.

The iron lode continues north into the 120 acres, F. C. Groom, but becomes concealed by basalt, which covers also 318 acres, A. J. Morris, and most of the 186 acres, W. H. Atkinson, still further north. The iron re-appears in the northern part of the 186 acres, and then continues as the well-known lode leased by the Blythe Iron Mines, Limited.

The Rutherford property has not been provided with adequate funds for its proper development, but the good ore already met with in the shallow drives is warranty enough for exploring the lode at increased depth. The width of pay ore is not yet sufficient to correspond with all requirements, but it is clear that remunerative ore exists, and its extent cannot be proved without further work. The mine is still in its prospecting stage, and perseverance in a vigorous programme of exploration is necessary for any results to ensue. The lode is likely to contract and expand along its course, and if it is not as wide as expected when intersected from the shaft, that should not discourage further work, but it should be followed, with a view of reaching points where it will be found to widen, as these will certainly occur.

North Commonwealth Mine.

This is on Section 876M, 80 acres, in the name of T. J. Dorgan, on the west bank of the Blythe River, 3 miles north of the Rutherford. I approached it by a track from the 250-acre farm of Mr. J. Morris. Inside the east boundary-line of this farm, the basaltic soil is replaced by the older rocks, which here consist of grey metamorphic sandstone, intersected by veins of quartz. A descent is here made gradually into the timbered valley of the Blythe. The first work on the property was started last July, by putting a short cut into the hill east of a small creek, where a foot of soft broken slate is showing. A few yards further north, about 35 feet were driven through clay slate with bands of pug, and at the end of the crosscut is a vein of quartz 2 feet to 18 inches wide, narrowing as it goes north, and also underfoot. The pug and quartz carry iron pyrites, but no copper so far. A good deal of iron is coming away with the water from the quartz vein. A few inches of quartz follow the north side of the drive, with pug and pockets of iron pyrites. The country is disturbed on this side of the drive, and as the latter is only 15 feet from the surface, it is too shallow for an opinion to be formed of the ground. There is evidently a silicified band of country, and it would be promising enough if any mineral could be seen other than iron pyrites. The crosscut is in an awkward place, below the level of the creek, and the hill spur falls going north. The better way would be to go further down the creek, and crosscut from there, though with increased length.

Further north, on the eastern boundary-line of the section, the hill spur which falls north-easterly to the River Blythe has been trenched across, but the trenches are not quite deep enough. Ferruginous quartz gossan occurs in pieces here and there, but no sign of copper is to be seen.

At 10 feet above the Blythe, below these trenches, the low north tunnel, a crosscut across quartzites, has been driven north-westerly for about 80 feet. At 36 feet in the tunnel a level has been driven off the tunnel, along a junction of sandstone with graphitic slate, where there is a band of silicified country. The distance driven was about 30 feet, but the lode-matter was soon left on one side, and the drive continued in graphitic slate slightly impregnated with iron pyrites. Further in the tunnel past this drive is a little quartz in soft black slate, and then hard, blocky grey quartzite continues to the end. The indications scarcely justify continuing the tunnel, besides which it is too near the north end of the hill spur to gain much depth. To prove the ground, it would be better to go further up the river, where the hill is higher, and then put a prospecting tunnel into the hill. About here are a few copper carbonate stains, and also a little copper pyrites.

A little south of the tunnel is a bold outcrop of grey quartzite traversed by numerous veins of quartz. It bears across the Blythe River to the north-east, running up the steep high bank on the other side, but seems to be quite barren of mineral.

Although this property is known as the North Commonwealth, and is, in fact, north of the Commonwealth, it is not on the same run of country as the latter. The Commonwealth belt runs to the east of it.

Commonwealth Mine.

This is on Section 874M, 80 acres, in the name of C. J. Leighton. The River Blythe runs through the section, but the mine is on the east side of the river.

About 30 feet above the Blythe a tunnel has been driven for 280 feet, 15° south of east, to intersect a lode outcropping higher up the hill. The outcrop line is bearing N.W.-S.E., so that if that direction is to be taken as a constant one, the tunnel has not taken the shortest course to cut it, and, in fact, would have to be driven 300 feet more before reaching the point of intersection. But this north-west direction is so different from that of all the other lodes in this copper-bearing belt, that the owners looked upon the course observed at the outcrop as abnormal at that particular point, and drove the tunnel east, believing that the lode would come round again to its natural strike. When the tunnel had been driven beyond where it was anticipated that the lode would be cut, a shaft was sunk on the outcrop to a depth of 30 feet. The lode in the shaft is split by a horse, and from the bottom a drive has been put in for over 20 feet south-westerly without picking it up again. The lode material is indurated slate and quartzose rock traversed by parallel veins of quartz, crossed in all directions by veinlets of the same mineral. There are signs of disturbance of the strata here, which is unfortunate just when the position of the lode is required to be located.

At the entrance to the tunnel a pyritic seam has been cut, and at 20 feet in a soft formation was passed through for a distance of 25 feet, and further in one or two seams of gossan and iron pyrites were intersected. The tunnel shows the same succession of strata as on the surface, striking north-easterly and dipping south-easterly. At about 200 feet in the slate becomes hard and dark, with large heads, and carrying pyrites on the joint planes. A little distance behind the end the slate arches over and forms a flat roof. A disturbed zone is apparently being entered, which makes it difficult to assure one's self of what is ahead. The present end is close upon 300 feet south of the shaft, and it would take 300 feet to continue the tunnel in its present direction in order to reach the lode, assuming the latter to maintain the same bearing as at the shaft. This distance could be reduced to about 170 or 180 feet by turning the adit in a north-easterly direction. There is some doubt, however, whether the lode has not recovered its normal bearing, and been intersected already by the tunnel. If this is so, its position in the tunnel ought to be about where the soft formation was cut not far from the entrance. Unfortunately, there does not seem to be any metal there. On the whole, it would seem advisable to explore from the shaft, and having located the lode, to follow it. I understand some nice copper ore was found at the outcrop.

At 100 feet up the hill, south-east of the shaft, is an outcrop of yellow gossan bearing north-easterly. This has been trenched upon, but though a nice-looking quartz-iron gossan, did not yield anything beyond iron in the Government laboratories.

On the western part of the section, a long spur of cemented rock comes down, which, for a couple of chains in width, has a gossanous appearance, and has been locally taken for lode gossan. It is, however, a cement of quartz and sandstone fragments, and evidently belongs to the sub-basaltic drift formation.

BLYTHE COPPER FIELD.

The Blythe and Stowport copper deposits are in one and the same geological area, though geographically separated by the Blythe River. The Blythe River, running north to the sea, has intersected the wide basaltic plateau, and carved its channel deep down into the underlying slate and quartzite strata which enclose the ore deposits. Consequently, these strata are exposed for about half a mile on each side of the river. The same process has taken place on the Emu River and Upper Chasm Creek. The

Stowport strata, having a north-easterly strike, are prolonged across the Blythe River into the Blythe field proper, and the same lode lines, both of iron and copper ores, are continued also. The Rutherford-Copper King line of lode can certainly be traced at intervals along a distance of 5 miles, and probably 7 miles, if McKenna's Heybridge mine on the sea-coast belongs to it, as, judging from its position, is most likely the case. The line passes beneath the basaltic farm lands in G. Rooke's 52 acres and A. Littlejohn's 50 acres, continuing doubtless under the 100 acres of A. Littlejohn, not far from Mr. G. Radford's house, and a mile further north-east ought to be visible in the slate and quartzite of the hills overlooking the sea. So far, however, it has not been picked up there, and this may be due to more than one reason. In the first place, these hills were at one time largely covered with basalt, and the bed-rock is still in many places concealed by the remains of sub-basaltic drift and cement, the latter of which is, as usual, often mistaken for lode gossan. Secondly, the copper deposits do not always happen to rise to the present surface of the slate strata. The persistency of the lode line for such a distance speaks strongly for it being found payable at more than one point in its course. The Blythe iron lode, too, shows a visible length of 3½ miles, its southern exposure being in the 320 acres, T. S. Rutherford, and its most northerly point being on the east side line of the 100 acres, O. Allen, forming the boundary between it and the 238 acres, C. and J. Robinson (60 acres, C. Sice). I have not seen it further north than this. It disappears here beneath the basalt, and does not emerge from it near the coast.

A great deal has been said about the possibility of the outcrop of the iron lode covering copper deposits. Of course, this question does not in the slightest degree affect the future of the Blythe Iron Mine as an iron ore property, because the huge outcrop on which it is proposed to work has been proved to be hematite down to river level. The small proportion of limonite and the absence of lode minerals contra-indicate a copper lode lower down. A very large number of analyses have been made, without disclosing the presence of copper sulphides or of any precious metal. As far as we know the occurrence, it is a large hematite lode. The latest facts learned appear to indicate a genetic association with the granite, which is near the southerly exposure of the hematite on Rutherford's.

At the same time, though the iron in this lode may not be associated with copper, there would appear to have been a deposition of copper along parallel lines, and wherever the iron development is strong, the parallel copper deposit is also pronounced, *e.g.*, at Rutherford's and the Copper King. Copper prospecting on the Blythe Iron Mines property has so far been unsuccessful, but the results are not final. At the northern end of the iron lode on Sice's 100 acres about half a chain of iron ore is exposed, with the characteristic red siliceous contact rock a chain in width on the eastern side of it. This contact rock here is sparsely impregnated with specular iron, iron pyrites, and copper pyrites, which strengthens the supposition that the deposition of both metals formed part of one physical process.

Prospectors on the Blythe Iron Mines Company's property have unsuccessfully sought copper ore on the west side of the iron outcrop, and the company has also done some abortive work in the same direction. A nice-looking outcrop of iron gossan, carrying pyrite and copper pyrites is exposed for a width of 3 feet in descending the hill on Section 1009, 73 acres. The edge of it is visible in a cut put north into the hillside, and it looks as if it might extend several feet further east. About 25 feet below, the company's prospectors have driven a tunnel below the outcrop, but failed to find anything beyond bunches of gossan with a little copper ore. It would have been better to have started the drive a little lower down. There has not been enough work done to prove the formation. A short T drive has been put in at the end of the tunnel, but the course of the lode should be followed further into the hill. Lower down, near the level of the river, what seems to be the same line of lode has been tapped by a tunnel, but without any result. Speaking generally, the prospecting for copper on this section has been too limited to test the ground adequately.

Copper King Mine.

This property, owned by Mr. L. J. Clark, is charted as 915-M, 63 acres, north of and adjoining the Blythe River Iron Mines 40-acre section. A turn off the main road from Heybridge is made at Mr. Sice's house, which is on the basaltic agricultural plateau, 650 feet above sea-level. On the way, the northern extension of the Blythe iron lode is crossed on Sice's 100-acre lot. South-west of this is a valley which has eaten away the large outcrop between here and the Blythe Company's 40-acre section. The basalt covering extends a little way down into this valley along its eastern edge.

On the west side of the track going down to the Copper King, and on the boundary between the 63 acres and O. Allen's 100 acres, is an outcrop of quartz carrying pyrites. The country-rock is a yellow sandy schist, or laminated sandstone, striking north-easterly and dipping south-easterly, and the quartz follows this strike. A few veinlets of quartz traverse the rock at right angles to the strike. A sample of the outcrop quartz was assayed by Mr. W. F. Ward, Government Analyst, but contained neither silver nor gold. A few yards below this, boulders of gossan occur, which have evidently rolled down the hill from some point higher up.

The copper lode (Clark's lode, as it is called) runs through the section in a north-easterly direction, with an underlay to the south-east. In strike it is conformable with the country strata, but in dip it certainly, in places, transgresses these.

The first drive which I saw was a cut into the hill on the course of the lode, but the approach had fallen in, and the face in the end was exposed to daylight. The drive has been carried for a width of 6 feet, 3 feet 9 inches of which are in soft lode slate heavily charged with iron pyrites, copper pyrites, and black oxide of copper, the remainder consisting of much harder lode stuff, with nice bands of rich copper pyrites. Some of this hard lode stuff which I sampled, and which was assayed by the Government Analyst, returned 15 per cent. metallic copper.

Ten feet below this, a crosscut tunnel (No. 2) has been driven 31 feet across the lode formation. This is the only place in the mine where the full width of the lode has been proved. Outside the tunnel mouth was a pile of over 12 tons second-class ore, estimated to average 7 per cent. copper, and which was taken from the crosscut in driving across the formation. Its gangue is quartz and carbonate of iron. Some seams of copper ore occur at the immediate entrance to the tunnel, and just inside a short drive has been put in (north) for 12 feet on an 18-inch seam of ore, which, however, has diminished in the face to a few inches in width. Some nice-looking red and black oxides of copper show in this seam. The main tunnel passed through alternate bands of hard rock and black copper ore. For 11 feet the lode matter intersected was poor, but afterwards about 10 feet of gossanous material came in and yielded the ore which is piled outside. The adit has been driven right through the lode channel to the graphitic slate country on the east wall. In the roof at the end of the tunnel a little gibbsite (aluminium hydrate) occurs. A drive south has followed the gossanous band for 12 feet, exposing some good oxidised ore in a siliceous gangue, the latter forming heads and blocks of stone. In the drive north the wall has broken away, probably through surface disturbance, as the workings are very shallow. At about 12 feet, a crosscut was driven east in gossan, but this is now built up. Good copper ore continues a few feet to the break. Past the crosscut, the drive seems to be on the west side of the lode, and is in a serpentine direction, turning east, however, and recovering the gossan. The latter continues, but lies mostly outside the east wall of the drive, which is practically between the slate and the gossan. Near the end, the gossan is stronger. Towards the end of the drive the lode is carried along the east wall, showing some copper stains and oxidised ore. A crosscut east is necessary here to tap the richer part of the lode. Unfortunately, it is only about 20 feet below the surface, and if the drive were extended, it would soon come out into the creek which lies ahead. As the hill spur runs out here, backs cannot be obtained. This drive is over 100 feet long. Some fair-sized pieces of native copper have been obtained from the gossan, which is often plentifully seamed with veins of quartz. The siliceous gangue is generally strongly charged with iron pyrites. On the whole, the best plan would be to continue the crosscut east in the drive north, and get to the other wall of the lode.

Upper Tunnel (No. 1).—This is a narrow crosscut tunnel driven west for 100 feet into the hill, cutting the lode at that distance. The lode has been driven upon south for 75 feet, and two crosscuts put into it from the drive at 52 feet and 12 feet respectively behind the end of the drive. The lode has been carried the width of the drive, but extends outside the west wall for at least 23 feet, as the south crosscut near the end is in the lode formation for that distance and not through yet. The formation as disclosed in this crosscut consists of hard, massive quartzose rock with veins of copper-bearing matter at intervals. A good deal of quartz enters into the composition of the formation, and a little good ore occurs here and there. The north crosscut also shows hard and barren stone throughout its length of 12 feet, but just behind the face is a vein of oxidised ore (with some gibbsite). The best ore in the drive is in the present end. Three-fourths of the face consists of graphitic slate, carrying copper and iron pyrites. A pile of about 10 tons of good ore was stacked outside the tunnel entrance ready for market, consisting of erubescite, copper pyrites, and oxide in a gangue of metamorphic slate, with veins and patches of quartz and disseminations of iron pyrites. Grab samples which I took from this heap, assayed by the Government Analyst, returned 10·5 per cent. metallic copper. However, shipments of ore since my visit have been made, returning for 20 tons an assay value of 15 per cent., and for 23 tons a value of 24·7 per cent. copper, according to returns furnished by Mr. Clark.

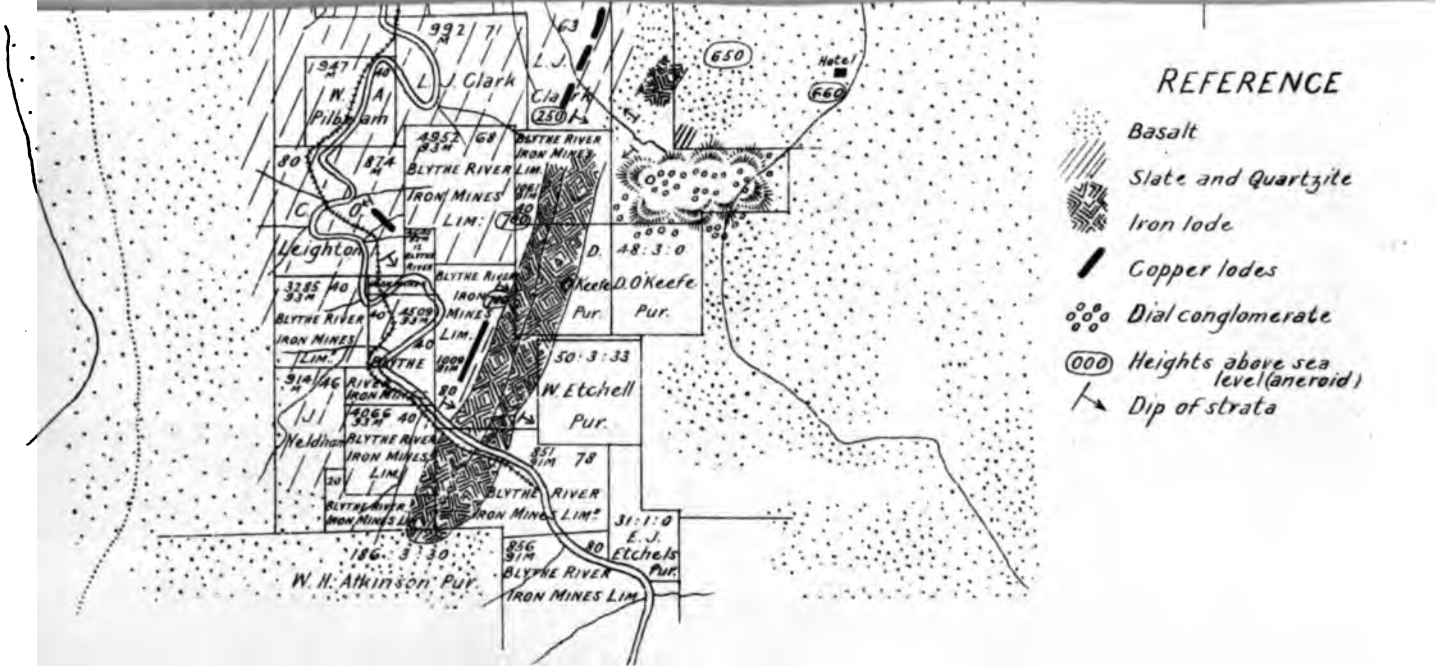
Northern Workings.—About a couple of hundred feet from the face in the drive from the No. 2 tunnel, the lode has been cut again in a short crosscut east from the branch creek. A 9-inch seam of copper oxide and pyrites has been cut through. A crosscut tunnel has been driven to intersect the lode, and at about 30 feet in, this passed through the same graphitic slate as seen outside, but no ore. A drive west passes through what would seem to be the lode formation, but nothing like the fine lode in the cut outside.

The line of lode is a persistent one, and of considerable width, nearly half a chain. The formation must not be looked upon as payable all through this width. The footwall portion seems to be that in which payable ore is most largely developed, though at the same time there are bands of ore elsewhere in the formation which will make frequent crosscutting necessary. The ore deposition partakes of the irregularity which characterises most lodes, but the large quantities of oxidised ore indicates the probability of a strong pyritic lode at greater depth. The mine cannot be done justice to with the present inadequate outlay on development work. According to the returns, the following are the parcels of ore already sent out:—

10 tons, assay value	....	13·7 per cent. copper.
12 tons, ,,	....	11·7 ,,
20 tons, ,,	....	13·2 ,,
20 tons, ,,	....	15·0 ,,
23 tons, ,,	....	24·7 ,,

This represents the result of work on a very limited scale, and with not the best methods. As such, it is encouraging, and points to a line of ore deposition here which invites vigorous work with ample capital for proper

BLYTHE MINERAL FIELD



development. The success of this mine will produce a marked effect on the field, which otherwise is in rather a languishing condition at present.

Evans' Mine.

The north-east angle of Mr. Clark's 63 acres is close to the south-west angle of Mr. J. Evans' (now W. Evans') 50 acres, near which some mining work is being carried on upon the northern continuation of the Copper King lode line.

Mr. Robt. Short started the work towards the end of last year about 80 feet from the south-west corner of the property, and on the strike of Clark's lode, as far as could be judged from the position. A rather shallow tunnel crosscut has been driven across the slate strata for a chain in a south-easterly direction. A lode formation has been cut at about 30 feet in, consisting first of a few inches of white clay in the roof carrying a little copper pyrites and stained somewhat with green carbonate of copper, but widening to 18 inches in the sole of the tunnel. This gives place to 3 feet of lode slate interspersed with quartz, and on the wall of the lode are a few inches of sugary quartz. In the approach to tunnel there is discoloured material for 4 feet with vein quartz and iron pyrites. The lode was cut in the tunnel at a depth of only 20 feet from the surface, and as 10 feet of the overlying material is soil, there is practically no cover. The drive is under a small creek, and consequently wet. Additional 30 feet could be obtained by going down the creek below the tunnel and bringing in another adit. The present adit has been almost useless, as it does not permit of any reliable opinion being formed of the lode. The samples of lode stuff taken did not yield anything appreciable when assayed in the Government laboratories. The kaolin which borders the lode and the slickensiding which is seen in the slate show that some movement has taken place along the line of mineralisation. The Copper King is about 18 chains south of this. Though there is nothing of importance at the shallow depth at which the lode has been tested, it is possible that if the latter could be reached at an adequate depth better results would ensue; but to do this it would be necessary to go a good way down the hill, when the length of crosscut would be extreme. The point to remember in this proposition is that it is the nearest to the Copper King of all the works along this line.

Up the creek at the camp is some gossanous and concretionary iron ore (limonite) of the kind usually found associated with the basaltic drift of the tableland. Being so near to the occurrence of iron ore at the Blythe, the casual observer might easily take the two as related occurrences. A better acquaintance with the district dispels this idea. The hard white quartz conglomerate found round the camp and lying unconformably on the older rocks is the drift sand which was hardened and cemented after having been covered at one time with basaltic lava. The same formation may be seen at the caves at Howth.

Smith's Mine.

A mile north-east of the preceding, Mr. Smith has been carrying on prospecting operations on a 40-acre section east of and adjoining F. Morris' 80 acres, 969-M. The section embraces the continuation of the Copper King metal-bearing strata, exposed along the western edge of the basaltic farm lands. A small creek rises in the north-western corner of G. Evans' 51 acres purchased land, and flows north-easterly into the section on which Mr. Smith is mining. The basalt land is on both sides of the creek, in the bed of which are the blue clay slates, in which several holes have been sunk. This is at about 380 feet above sea-level. The strata preserve their usual bearing of north-east, but are dipping here north-westerly. The section shown by a cut across the lode formation is 1 foot of quartz on the footwall, succeeded by soft puggy slate in patches, graphitic slate containing lumps of dense iron pyrites, and dark slate with curved laminæ, measuring with the quartz 4 feet in width. Seven feet of hard micaceous rock underlies the footwall quartz, and outside this is slate again with veins of quartz and pyrites. The puggy slate in the lode is also veined with quartz. A little copper pyrites is present, associated with carbonate of iron and quartz.

Thirty feet north of this, a cut failed to pick up the lode. A little lower down the creek two cuts have been put in in opposite directions. The western one, which goes into the bank below the basalt, has only passed through slates. The east cut is an excavation of about 9 feet in indurated micaceous slate with thick veins of quartz in it, and very dense iron pyrites along the planes of parting. There is no copper here, but quartz a few yards to the south-west carries a few specks of copper pyrites.

The great development of iron pyrites is a feature of this formation, but there is very little copper. The samples which I took were assayed by the Government Analyst, with negative results. The lode can be prospected by sinking or by crosscutting further up the creek, but before undertaking the latter, it must be ascertained whether the lode does not cross the creek, as there is some possibility of it doing. The question is, whether there is any likelihood of copper ore coming in in depth. At present the quartz exposed has only a few specks of copper pyrites in it, and the absence of staining and oxidation is not a favourable indication. There is undoubtedly plenty of evidence of lode action, and though there is not much to encourage one, the possibility of copper deposition at a greater depth or somewhere else along the course of the lode always exists.

A good deal of ironstone cement exists on the hill to the west of this creek, and about 2 chains in width of this gossan-like cement overlie a tunnel which has been driven south-westerly into quartzite along a quartzose and quartz lode carrying abundant iron pyrites, but no copper. The underlay of the strata here is to the east, and the lode is perhaps more directly on the strike of the Copper King than the eastern workings in the creek are. The ferruginous cement on the surface is locally believed to be lode gossan. This is a mistake. It has nothing to do with any lode which may chance to be below it, but is the cemented sub-basaltic drift so frequent all over the district. Just west of it the basalt covering still survives in a small patch.

Edwards' Mine.

This is on a 40-acre section immediately north of the preceding, and west of the purchased lot, 52 acres, in the name of G. Rooke. The strata and lode formations are the prolongations of those on the section to the south. Messrs. Edwards started operations down on the bank of the creek on the eastern boundary of the section about a year ago. A tunnel has been driven east across slates veined with quartz for a distance of nearly 40 feet. At the entrance is a seam of soft slate mixed with quartz, then the tunnel passes through hard quartzose country, and again into slate. A little ore has been got in driving (copper pyrites). An excavation in slate south of the tunnel has given a little native copper, and but for this indication, the drive would not have been put in here, but higher up the creek, where some copper-pyrites has been found. Up the hill is a broad band of gossan-like iron ore, which, however, contains no valuable metal, and is probably of the same origin as the other occurrences of concretionary ore in the district. Mr. Edwards' mine appears, by position, to be on the continuation of Mr. Smith's eastern show. Though the line of mineralisation right through from Rutherford's is a long one, it does not follow that one and the same lode continues through without interruption. It is more likely that the lode shoots tail out and separate ones start, not exactly on the same line, but on parallel lines, the whole, however, forming a mineralised belt which is continuous all through these mining sections.

Behind Mr. Edwards' farm and below the basalt, a belt of hard grey conglomerate is exposed in the bank descending to a creek. The rock contains iron pyrites sprinkled through it rather plentifully, and a little copper pyrites is said to have been found. The rock is very siliceous, and contains numerous white quartz pebbles and some jasperised stones. There is not enough of it exposed to show the relations of this bed, and it is too isolated an occurrence to justify any definite statement about it as an ore-bearing stratum, but search should be made for a lode along either side of it, as it is not likely that a rock of this hardness will be fissured very much.

Farther south, where the road passes through O. Allen's 100 acres, boulders of the Dial Range conglomerate are seen by the wayside, and a small hill to the west is composed of this rock. This is the only patch of these conglomerates which I have seen in the district. I was told, however, that they extend further south on the east side of the Blythe iron outcrop.

Bramich's Mine.

This is on the 40-acre section north of Edwards' mine, and west of and adjoining G. Rooke's 52 acres, purchased land. A turn off from the main road leads through scrub down to a small creek about 100 feet above sea-level, where work was started a year ago to pick up the line of the Copper King lode. A small drive has been put in for about 18 feet, across dark slate and seams of pug with splashes of copper associated with carbonate of iron and a little quartz. The last 4 feet are in smooth slate, locally called schist. The drive was intended to intersect some copper-bearing slate seen in the creek about 30 feet further north. Further down the creek another cut shows a band of black slate with veins of quartz carrying iron and copper pyrites; a few more cuts have been put in still lower down the stream. One of these is in hard quartzose rock traversed by veins of quartz and carbonate of iron, carrying splashes of clean copper pyrites here and there. The right course has been pursued in crosscutting into the belt at intervals along the creek, in preference to sinking at one spot.

No body of ore has been discovered, but a good deal of mineral is scattered through the rock in these workings, and it may well be that there is more ore in the neighbourhood. It is intended to go about 50 yards further down, and crosscut through the formations for 100 or 150 feet. This seems feasible, and should be a useful test.

Up the hill to the west a belt of the white Tertiary quartz conglomerate is met with, and still higher is a large spread of gossanous material covering Tertiary drifts and lignite with impressions of twigs and leaves of European trees. The lignite is highly sulphurous, with decomposing secondary pyrite.

A tunnel has been driven into the side of the hill below the gossan at 80 or 100 feet above the creek, exposing 2 inches of pipeclay resting on 7 feet of brown clay and lignite, the whole lying on the upturned edges of schistose bed-rock. The dip of this formation is away from the present creek, showing that the latter has carved out its channel subsequently. The gossan has been mistaken for a lode capping.

North of this section is one held by Mr. Radford, taken up presumably for position. West and south-west between here and the Blythe River the ancient slates and quartzites are exposed, and several discoveries of mineral have been made, which at present are not receiving much attention, pending developments on the field.

Heybridge Mine.

After leaving Bramich and Radford's claims, the Copper King line of lode passes below the basaltic farm lands, and the next trace of any lode action visible is met with at the Heybridge Mine, between the road and the railway, about 15 chains inside the east boundary of Heybridge township.

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sub-basaltic gravel or quartz conglomerate, or gossanous material, and in the Howth cliffs below this, heavy shingle wash is seen resting on hard white quartz conglomerate, all of Tertiary age and lying on ancient quartzite. The conversion of these loose sediments into hard siliceous conglomerates is instructive. It is difficult at first to realise that they are not rocks of far higher antiquity.

Manganese at Mouth of Blythe River.

On the beach east of the mouth of the River Blythe there is a blow of manganese gossan, which lies about in lumps over a wide area, though the main outcrop occurs as a reef-like mass of boulders. If it were a reef, it would enter the hill behind McKenna's hotel; but it is improbable that the occurrence is anything other than a deposit. Manganese, removed from older rocks in minute quantities is precipitated as a hydrated peroxide from solutions derived from decaying organic matter. It is found on the beach at the mouths of several streams on the North-West Coast, but mostly impure, or when pure, in insufficient quantities to be of economic value. It is devoid of gold or silver values.

Blythe River Iron Mines.

The huge outcrop of hematite on this property is still unworked. I visited it again this time, to see if a renewed examination would suggest any additional conclusions to those expressed in my report of 30th January, 1901. I do not see any reason for modifying my then stated opinion of the value of this deposit of iron ore, based upon its outcrop and the results of the exploratory tunnels. The mineral discoveries in the district during the last few years have, however, made it highly probable that the ore-body is the result of lode formation, and indeed, directly associated with the granite to the south. Although it has copper lodes as neighbours, there is reason to believe that it is an independent primary mass, and not derived from the oxidation of iron or copper pyrites.

Alluvial at Upper Blythe.

Two miles higher up the Blythe than the iron outcrop, Adams' Creek, rising at Riana, falls into the Blythe River, cutting through a deposit of Tertiary gravel. On the south side of the creek, on Mr. D. Wescombe's property, it is associated with the usual sub-basaltic pipeclay. On

the north side, Mr. Peter Price has put a cut into a terrace of sand and felspathic clay, about 40 feet above the flat ground; and a little higher up the road the wash is exposed in the drain, where it is also very kaolinic in nature, evidently derived from granite not far off. In fact, the granite country comes in a mile further up the Blythe, extending in one direction west to the south of Rutherford's and in the other south-east to the southern boundary of Riana township. This wash, being so near the granite, might be expected to be charged with gold or tin. Some of it shows a colour or two of gold, but nothing at all encouraging. However, it is not impossible that in places better results could be obtained. This is an ancient body of wash, which was deposited before the outflow of the basalt which caps the surrounding hills, and has been cut into and much of it carried away by the modern Adams' Creek. The height of the creek here is about 200 feet above sea-level.

The river flats on the bank of the Blythe are formed of modern shingle and wash. West of the Blythe, on Mr. Edward Addison's 314 acres, I was informed that beds of limestone exist. These would be useful in the event of any local iron ore smelting being started.

Alluvial Ground at Primrose Park, Howth.

On this estate, situate up the Nine-mile Road from Howth railway station, and on the divide between Heybridge Rivulet and Sulphur Creek, the creek east of Mr. Taylor's homestead exposes a bed of clay charged with carbonaceous matter and imprints of Palæogene leaves. This deposit has been sunk into 6 feet without bottoming. On the east side of the creek the bank has been cut into, and shows about 4 feet of conglomerate or cemented wash below 10 feet of pipeclay and grey clay.

A quarter of a mile to the south of this, Mr. Cameron put in a couple of cuts in the bank on the east side of the creek in yellow and red clay, carrying two flat seams of iron and manganese oxides.

These workings are in the sub-basaltic formation, in which no lode can be expected to exist. The lumps and boulders of siliceous chalcedonised rock occurring in the farm soil belong to the same formation, together with boulders of brown and micaceous iron ores ploughed up or occasionally rooted up by falling trees. The height of the basaltic tableland here is 350 feet above the sea. Descending from the house to the road, the bed-rock of white sandstone and soft schist is exposed, showing a strike of N. 70° E., with a dip to the north-west.

The sub-basaltic drift is distributed so generally over the coastal tableland from Rocky Cape to Ulverstone, that the discovery of leads or gutters in it is no easy task. Its exposure in existing creeks is merely accidental, and no indication of a channel at any of the particular points where it is found. Its general deposition is more likely to have been due to estuarine or even marine action than to rivers, though earlier gutters may possibly be still concealed in it here and there. It is these gutters which will probably yield payable gold, and not the general drift layer, which has filled up the old channels and been uniformly distributed over the country.

In concluding my remarks on this part of the coast, I repeat my impression that the Stowport-Blythe field gives fair ground for hope that in the future it will become an established seat of copper mining. The mineral-bearing series of strata are there, and there are plain evidences of lode action, and modest shipments of quite nice copper ore have been made. The two premier mines have shown lodes which offer every encouragement for deeper mining. In spite of this, a drowsy air pervades the field, and every one seems to be waiting for something to turn up. What is wanting to revive the springs of action is capital. The undertakings are very imperfectly financed, and will really be a hindrance to the progress of the field rather than a benefit, unless adequate funds are provided for working in a proper manner. The splendid farm lands in the neighbourhood will be of great advantage to the mines when the latter are established; but in the prospecting stage they are rather the contrary, for the district is inhabited by farmers, whose chief attention is rightly directed to agriculture, and not by miners and prospectors who would overrun the country and doggedly tear every outcrop and indication to pieces in their search for mineral. To the agricultural community this is new work, and besides, they cannot afford the time. There can be no doubt, however, that fresh discoveries are to be made in country so promising as this is. Meantime, the development of those which have already been made is greatly to be desired.

Eventually, too, the iron and steel industry, which is destined to derive part of its raw material from the Blythe deposits, and to be an important factor in the future commercial prosperity of the State, will draw increased attention to this part of the North-West Coast.

PENGUIN AND DIAL RANGE.

Tasmanian Iron Company's Mines.

The deposits of red hematite are still worked by Mr. J. C. Ellis, though severe Australian competition has been encountered, in consequence of which the output is temporarily reduced to about 150 tons per week. The grade of ore shipped has been maintained at 67 to 68 per cent. without difficulty. The known deposits extend for 1¼ mile along the creek in the form of boulders and nodules of hematite from creek-level up to the edge of the basaltic tableland, and constitute a mass of iron ore of great purity. The ore, as mined, is shipped to New South Wales for flux in smelting furnaces. The nodules strongly suggest the transmutation of pebbly beds of sediment to iron oxide, and the question is whether these beds belong to the Dial Range conglomerate series or to some other similar strata of later age. I am disposed to think it quite possible that they may belong to the gravel and conglomerate wash series underlying the basalt; and hence, may extend below the farm lands for a great way horizontally, though probably nowhere deeper than 200 or 300 feet below the surface.

Along this coast we have at least four different sources of iron ore, and it is necessary to recognise these sources before it is possible to properly appreciate the occurrences. First, there is the outcrop at the Blythe, which may be regarded as a primary derivation from the granite. Second, the Iron Cliff outcrop, which is a hydrated ferric oxide derived from the decomposition of iron pyrites in all probability, and forming the cap of a lode containing metallic sulphides. Third, the iron conglomerate near the top of the Dial Range, where the pebbles of the Devonian conglomerate have been converted to more or less pure hematite. Fourth, the nodular iron deposits of the Penguin Creek, assumed to belong to the sub-basaltic beds of gravel and conglomerate.

Thus, it is of no use to connect these deposits with one another, as is sometimes done, for they are distinct in origin. When the iron industry is started, some of these Penguin deposits will be available, and will contribute in no mean degree to the total output.

Dial Mine.

The old tunnel on Section 3190, driven north, has been abandoned, as well as the one driven south on Section 3188, and a new low adit has been started on Section 3189, about 20 feet below the south tunnel and at right angles to it, being driven 130 feet S. 70° W. The rock through which the drive passes is, or has been, a crush breccia of a granitic or quartz porphyry nature, which has been developed at the contact of the granite with the slate. At the entrance it has been reduced to a light-coloured clay, and it continues soft for about 100 feet in the tunnel. It then becomes harder, carrying grey and dark patches of pyritic rock and white clay. In the end seams of iron pyrites pass down the face. This clay is not argentiferous, and the pyrites does not contain any precious metal. The idea is to drive right across this breccia formation to its contact with the slate on the west. It is at the contact that the best chance offers of finding lode minerals of value, but the unfortunate feature in these drives is that they are not very deep. However, if anything like a lode is met with, it can be followed into the hill. From the appearances in the various drives, it is not probable that anything of importance will be found far from either margin of the broken country. This shattered zone of rock is 500 or 600 feet in width. There is, however, always the likelihood of a strong deposit of copper being found in depth, and this property will never be satisfactorily tested without deep sinking. Some fair assay returns for copper were obtained from ore from the old shaft on the north section in 1898-1900, which would warrant the belief that payable shoots exist in the pyritic formation. The iron pyrites is especially abundant. It is crystalline, and good cabinet specimens can be obtained. Its precious metal contents are variable, being from traces up to 1 dwt. 15 grs. gold per ton; silver, nil. The same variability exists with respect to the copper pyrites, in which usually traces only of gold are found, and from 15 dwts. to 3 ozs. silver per ton. This ore is often faced with a film of black oxide of copper. The general looseness of the formation makes it possible that a good deal of metal has been removed in solution, and will be found in concentrated form at a greater depth.

Revell's Workings.

On Section 2880-93M, and on the east side of the Dial Creek. The country is part of the same brecciated contact belt as exists at the Dial and Keddie's mines; but the precise width of the formation here is not known. Granite is known to the east, and slate exists to the west, and this significant band of broken, mineralised rock lies between.

Mr. Revell has driven a cut into the hill in a south-easterly direction for 20 feet into the decomposed rock, which carries here iron gossan veins. Where any fresh rock is seen, it is of a quartzose, hornstone-like, and sometimes even of a granitic appearance, and extremely hard. The granite is evidently not far off. There is none of the friable formation which prevails at the Dial Mine, and driving, once the work advances under cover, will probably be slow. Backs of 100 to 200 feet can be obtained by extending the drive into the hill. The lode lies flat—about 45°—and is a good deal stained with blue and green carbonate of copper. The country-rock contains large included fragments, and is blocky, with large heads. Some of the gossan has been copper-bearing, and it would be worth while proving the formation, by driving into the hill. If anything encouraging were met with, the lode could be further tested by sinking near the Dial Creek.

A little further up the creek is a development of hornstone with iron and copper pyrites on the joint faces. The rock is excessively hard, and not favourable for much ore deposition.

A chain further up the stream another cut has been put in: also in hornstone breccia, showing nice-looking gossan and copper stains. This contact-line has been traced still further south, but its boundaries are undetermined, and until they are ascertained, work will necessarily be uncertain, and, in a measure, at random.

Contact lodes such as these are often rich, but always irregular and expensive to work. The lode action which is disclosed on these contact properties at the Dial has been extensive, and the poverty of so much mineral suggests leaching and re-deposition of the valuable constituents at a lower level. This consideration points to the necessity for deeper exploration than has been as yet contemplated. Shallow working cannot be expected to throw much light on the deposits.

Rogers and McKenna's Mine.

This was formerly known as Hardstaff's mine, and is situate south-west of the 101 acres purchased by W. Russell, west of the Leven, 3 miles south of the Dial Creek.

The lode outcrop on the side of the hill, one of the slopes at the base of Mt. Duncan, bears north-easterly and dips north-westerly, at an angle of 45° or 50°. It is in granite rock, and occupies a fissure from 18 to 21 inches wide.

The lode action has altered the granite on each side for about 4 feet, producing a quartz wall-rock, which borders the lode proper. The lode itself consists of quartz and carbonate of iron, carrying iron and arsenical iron and copper pyrites and glance.

About 50 feet below the outcrop line, a crosscut adit has been driven north-westerly into the hill for 200 feet in granite, and at 108 feet in a small lode of carbonate of iron, copper, and iron pyrites, only a few inches wide, was intersected and followed south for 20 feet. The lode passed out of the drive, and the face now shows only barren country. The main adit was then deflected north, to follow a rock face which was believed to be the lode wall, but as nothing was found, its course was brought back to a north-westerly bearing, and driving was continued in the hope of the lode still being ahead. After taking measurements, the conclusion was forced upon me that the lode cut in the adit must represent the one which crops out at surface, and which has suffered a temporary pinch. The owners have now continued sinking the outcrop winze, and intend to drive south from it. At about 30 feet down I am informed that the lode has widened out to 2 feet 6 inches, and carries veins of rich ore. Some samples sent up from the mine and taken from across the lode in the winze were assayed by Mr. J. D. Millen, A.S.T.C., with the following results:—

No. 1.-	Copper	19·48 per cent.
	Silver	12 ozs. 15 dwts. 1 gr. per ton
	Gold	Nil
No. 2.—	Copper	6·49 per cent.
	Silver	17 ozs. 19 dwts. 8 grs. per ton
	Gold	Trace

Samples of the iron pyrites from the outcrop returned 1 dwt. gold per ton in the Government laboratories, and I believe some of the copper pyrites went higher than this. Ore of the above quality, say, averaging 13 per cent. copper, would return the owners about £4 per ton, less the cost of transport to the sea-coast. What is wanted, of course, is that the lode should widen a little and carry a continuous and good shoot of ore. From the outcrop it is difficult to say how the lode will behave in depth. The question can only be settled by actual work.

The country south and east of this mine is unalienated mineral land, and 3 miles south are the copper deposits on Walloa Creek in metamorphic slate strata striking north-easterly and dipping south-easterly. The whole district bordering the Dial Range on its east side has been imperfectly prospected, and the discoveries which have been made have been imperfectly developed.

PENGUIN COAST-LINE.

The old Penguin and Neptune mines are still in their abandoned state, and I doubt whether any renewal of work would be judicious, unless at a reasonable depth. The country-rock is meshed with veinlets in a way which debars profitable work at the depths at which mining has been carried on here, and the only chance is by getting down below this fractured zone and proving the lode channel in depth. The constant percolation of water has probably assisted in taking the richer elements of the lode to a lower level, besides which, the lode channel will most likely be better defined lower down. The variations in assay returns point very strongly to leaching having taken place. Shafts sunk 300 or 400 feet would give access to the formation at a depth which would disclose its real nature. These beach mines attract the attention of every one travelling along the coast, and one hears fabulous tales of their silver values. When one examines the outcrops and all that there is to see above ground (for the underground works are flooded), the impression left is not encouraging. But the case is not so bad as it seems at the first glance, for drives only 50 and 70 feet below the surface do not prove anything. They might just as well have not been driven for all the results to be expected. From the work done, however (especially by Mr. Ellis, at the Neptune Mine), we see that the ore yields about ½ oz. silver per unit of lead, which is a low silver ratio. Mr. Montgomery's samples returned nearly 3 ozs. silver per unit of lead from the Penguin Silver Mine, but the ore was unusual, for it contained 2·5 per cent. nickel and 0·8 per cent. cobalt. We have really nothing but shallow burrowings and impoverished outcrops to base any calculations upon, so that I do not see that there is as yet any reason for despair.

Parson's Outcrop.

Mr. Parsons has an outcrop of nice-looking gossan south of M. Clarke's 33 acres on the Penguin Creek. It consists of ferro-manganese and limonite, but the samples which I have tried do not contain any precious metal. This discovery seems to be on the strike of an ironstone reef running out to sea west of Penguin Point. It is apparently

Geological sketch Map
# of Coast Line at
PENGUIN

W. H. Twelvetrees

a replaced quartzite. At some points in its course it is not at all unlikely to be auriferous.

From the preceding, it will be seen that there are potentialities in the Penguin and Dial Range district, possibly convertible in the future into actualities. Sooner or later the iron deposits will be more valuable than they are at present, and any successful work, either on the beach lodes or in the ranges, will give a powerful stimulus to the district. The district lies at present in the backwater of the stream of exploratory and industrial mining, but there is really nothing in the surface indications or in the shallow work results to forbid, but on the contrary, a good deal to warrant, the expectation that more thorough exploration and deeper work will reveal payable copper and silver deposits at more than one point in this rather wide area.

FORTH.

Basaltic agricultural land caps the hills on either side of the Forth Valley. The volcanic sheet, however, forms only a thin covering of the ancient rocks, which have been cut down into by the stream and are exposed on both sides of the picturesque river gorge. The country has not been surveyed geologically, and hence the stratigraphic relations of these rocks are not known, but from their lithologic characters and aspect there is reason to believe that they belong to our most ancient series, viz., Pre-Cambrian.

I spent a day at Hamilton-on-Forth in 1903, and another day on this journey, and in this space of time could only cursorily note the geological features of the country, which, however, are replete with the interest which necessarily attaches to the ancient foundation rocks of the island.

Opposite the township, and on the west bank of the river, is a crag of white quartzite, forming a belt flanked on the west by mica quartz schist, which runs north and south and dips westerly. About ¾ mile south of the township is an intrusion of serpentine rock about 200 feet wide, which seems to follow the general strike of the country, a little west of north, as it re-appears on Mr. Smith's estate of Westwood, near the coast. Half a mile further south a beautiful garnetiferous hornblende schist is seen in Mr. Field's garden along the road, and ¼ mile further a reef 6 feet wide of flesh-coloured vitreous quartz occurs at the water's edge in the same band of schist, which is here very ferruginous and specked with iron and copper pyrites. At the Devonport waterworks intake on the Forth is a dyke of felspar porphyry* of reddish-brown colour, about 3 chains wide. Immediately south of the waterworks building slate comes in with a N.-S. strike.

Cooper-Smith's Iron Formation.

This is on Mr. Cooper-Smith's farm, a mile north of the waterworks. Near the farm-house is an outcrop of ferruginous quartzite, forming an iron ore deposit exposed for about 25 feet in length by 10 or 12 feet in height, and another outcrop, rather impure, occurs on the low flat to the west. East of the quartzite, the strata consist of soft, wavy schists, with laminæ and eyes of quartz, changing in parts into graphitic schists. On this bed-rock floor of schist and quartzite rests a body of wash with large rounded stones. Colours of gold are obtainable in this wash and the river bed. The high flat field to the east is all wash. Basalt caps the hills on either side of the river, and careful examination would no doubt make it possible to distinguish between the older drift, which was once protected by the basalt covering and the modern shingle of the River Forth. The older wash might very well contain a payable run of gold. The lower flat bordering the river is probably modern.

The iron ore is too impure for economic purposes, and is so irregular in its segregation that sufficient quantities could not be relied upon with any degree of confidence.

About 300 yards south of the house is a gossan formation in the bank of the river, which is said to pass over to the western bank. It looks very much like a lode. The rock in which it occurs is not visible, but micaceous schist or quartzite exists between it and the other iron ore. The outcrop is not opened up sufficiently to see exactly what it is.

Barrington Copper Mine.

This is situate about 3 miles south of the angle made by the junction of the River Wilmot with the Forth, and is reached by a foot and bridle track through the bush from the bridge at the junction. South of the bridge, the rock is an ancient metamorphic sandstone or greywacke of a massive habit, somewhat simulating an eruptive rock. It extends for some distance. The mine was started twenty-five years ago by a local company, consisting of Barrington, Don, and Forth people, and registered February 15, 1881.

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* Felsite-porphyry (Rosenbusch) = a variety of quartz porphyry, in which the porphyritic crystals are felspar, not quartz.

A tunnel has been driven into the hill at creek-level for nearly 400 feet in a north-westerly direction on the course of slate strata (dipping south-westerly). The end has passed under an outcrop of gossanous slate occurring a couple of hundred feet higher up the hill, and on which a shaft has been sunk for 30 feet. The end of the tunnel is upwards of a chain north of this gossan, but no lode has been intersected. Three crosscuts have been driven from the tunnel at intervals in a south-westerly direction. These crosscuts have touched a parallel belt of hard pebbly sandstone or breccia, which is also seen outside the tunnel entrance to the west. The first one intersected a flat vein, 1 foot to 1½ foot wide, carrying a little copper pyrites associated with baryta and siderite, as well as vughy quartz. This was followed for some distance by a drive parallel to the tunnel. A crosscut 50 feet ahead of the end of this drive failed to pick up anything; and a crosscut was driven from the tunnel north-easterly to see whether the mineral continued in that direction. Nothing, however, was met with, beyond a little baryta and specks of pyrites. I am told that 9 cwts. of copper pyritic ore was obtained.

Higher up the hill beyond the gossan outcrop is another occurrence of gossan, on which a shaft has also been sunk, but has passed through it. A small cut to the west has also traversed it. It has a nice appearance, but is apparently superficial and irregular. It is in slate country, and near the conglomerate or breccia contact. My samples, assayed by the Government Analyst, yielded neither gold nor silver.

The occurrence of mineral here cannot be well understood without a knowledge of the geology of the country west of the breccia formation, as the latter may possibly be a shattered contact zone bordering an intrusion of some eruptive rock. In that direction there is a rock stained green with chrome, but it is too badly preserved for identification; still further west I was told there is gabbro, and then slate succeeds again.

About 300 feet above the creek is a boss or crag of pebbly quartzite, with segregations of quartz. And at the crown of the hill, Mr. Leslie Smith has sunk 9 feet into a favourable-looking gossan, which, however, has probably been derived from the country-rock, into which it seems to merge. Samples assayed in the Government laboratories gave negative results for gold and silver.

Some sort of lode action has evidently taken place at this mine, and produced the lode minerals, baryta, siderite, and copper pyrites. The latter may be seen scattered in the breccia, but so far all the prospecting has not revealed anything in the shape of a solid lode. The prevalence of pyrite in the country-rock may account to some extent for the abundant gossan. My examination of the outcrops and work done resulted in an impression far from inspiring, but as said above, there is an unknown factor which may yet lead to some discovery in the breccia belt.

CONCLUSION.

From the above, it will be seen that the North-West Coast is a mineral area, in which certain belts of country occur possessing indications pointing to the existence of deposits of economic value. Mines showing payable concentrations of iron and copper have already been opened at Stowport, Blythe, and Penguin. And there are other places where mineral has been uncovered, but not yet in sufficiently remunerative quantities. With so many indications, surprise is sometimes expressed that not more discoveries are made. But the districts have not had their fair share of prospecting, and when money has been expended, it has often been laid out improperly and uselessly. Work, too, has been intermittent, and often separated by long intervals of time. The districts are also largely agricultural, and do not possess prospectors of the right stamp. The geological conditions for ore deposits are present, and I do not doubt that mines will gradually spring up, but lodes will not be found indiscriminately distributed all over the coast. I have endeavoured in this report to suggest the zones in which search should be made. These ancient rocks are often extremely hard and tight, and not favourable for ore precipitation, except along certain lines of weakness. These lines require to be sought, followed, and examined intelligently and well. Unfortunately, such work takes time, and in nine cases out of ten, is unremunerative from a bread and butter point of view. In the tenth case it is successful, and the reward is not to the discoverer alone, but is shared by the inhabitants of the district as well as by the State at large. It is this sort of work that is wanted on the North-West

Coast. A cursory trip into the bush will not do. Intelligence, perseverance, and financial support are the requisites.

The great granite contact area at the base of the Dial Range is one which is well worth exploration. The reason why such zones of country are specially favourable for mineral deposition is because after the heat generated by the intrusion of the eruptive mass has subsided, the consequent shrinkage tends to leave an open space more or less between the intrusive rock and the rock upon which it impinges. This space is seized upon by the metal-bearing solutions and vapours, which also penetrate the adjoining strata, so that ore deposits are produced not only at the actual contact, but also some distance away. Subsequent earth movements often follow these lines, which have become lines of weakness, and this faulting prepares the channel anew for the further introduction of metal-bearing solutions. The intelligent miner therefore looks upon these contact zones with favour; and it is because the above-described indications are so pronounced at the Dial that a hopeful opinion of the future of the district may be entertained.

The ores of the copper mining field of Stowport and the Blythe are not exactly contact deposits, though the lode action is connected with the proximity of the granitic mass. It is the nearness of the eruptive rock, with all its mineralising signs, which inspires those who are mining here with the confidence arising from the knowledge that they are working in the sort of country which is relied upon elsewhere as favourable.

So many residents along the coast extended to me hospitality and assistance, that I cannot mention them all by name, but I beg here to thank them cordially for their kindness.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES,
Government Geologist.

W. H. Wallace, *Esq.*,
Secretary for Mines, Hobart.

RECORD OF OBSIDIANITES, OR OBSIDIAN BUTTONS, IN TASMANIA.

By W. H. TWELVETREES.

DURING recent years some more of these interesting though still mysterious objects have been found in Tasmania, and it seems desirable to place the localities on record, as a knowledge of their distribution and conditions of occurrence may assist in forming some idea of their age.

The locality list brought up to date stands as follows:—

1. **Weldborough, Union Claim and elsewhere.**
2. **Fossil Creek, a tributary of Main Creek.**
3. **Springfield, near Scottsdale.**
4. **St. Leonards.**
5. **Cox Bight.**
6. **Middleton Creek, Long Plain.**
7. **St. Helens.**
8. **Supply Rivulet, River Tamar.**
9. **Pioneer Tin Mine.**
10. **Amber Creek, near Gladstone.**
11. Wyniford River.
12. Moorina.
13. Camden Plain, Mt. Barrow.
14. Lisle gold diggings.
15. Back Creek, Lefroy.
16. Thomas' Plains.
17. Norfolk Range.
18. Schouten Main.
19. Tallywong Creek, Weldborough.
20. Hunt P.A. Mine, Derwent Creek.
21. Thureau's Deep Lead Mine, near St. Helens.
22. Smith's Creek, Long Plain.

It may be as well to record the information obtained as to their occurrence before the particulars pass into oblivion. It seems to be clear that no evidence has come to light which would require us to assign to them a date so far back as early or middle Tertiary. They have nowhere been found in gravel protected by the middle Tertiary basalt. I have repeatedly made enquiry at Derby, but always with negative results.

1. *Union Claim, Weldborough.*—Mr. J. C. Macmichael found a perfect specimen of the button type in the sluice-box at the old Union Tin Mine on Fancy Creek. It came from clay 6 feet below the surface overlying tin-bearing gravels, believed to be of Quaternary age. Several specimens were also obtained by Mr. Gaylor.

2. *Fossil Creek.*—One was found in the Quaternary tin-wash of Fossil Creek, a tributary of Main Creek, a mile and a half north of the preceding locality.

3. *Springfield.*—This button was found by Mr. John Cherry at the bottom of a 6-inch bed of quartz-wash, lying on granite, and at 2 feet 6 inches from the surface. Mr. Cherry also found another lying on the surface of the ground a mile distant.

4. *St. Leonards.*—Mr. Simmonds obtained one two years ago half a mile south of St. Leonards railway station, on the surface of soil in a field which had been ploughed at one time. The specimen was well worn.

5. *Cox Bight.*—These specimens were found by Mr. Christopher Iles, when working the tin-drift at this bay on the south coast. The drift is derived from the granite which forms a patch at the southern end of the Bathurst Range. The buttons were found at a height of 100 feet above the sea, under 2 feet of button-grass peat and on the top of about 3 feet of tin-wash, the latter reposing on the bedrock.

6. *Middleton Creek, Long Plain.*—Mr. Simmonds reports one found here in gold-bearing wash, at 3 feet from the surface.

7. *St. Helens.*—A peculiar horn-shaped or shell-shaped fragment, similar to some forms found in Western Australia, came into the possession of Mr. Geo. A. Waller, from some unknown locality near St. Helens.

8. *Supply Rivulet.*—A specimen from here was found by the late Dr. Milligan, and reported to the Geological Society of London by the Rev. W. B. Clarke in 1856 as a volcanic bomb.

9. *Pioneer Tin Mine.*—In 1903 Mr. Cecil E. Ryan, the general manager, showed me a fragment of a button found on the mine at 4 feet from the surface, and resting on a bed of pug or clay 16 feet thick. Below this clay was a layer of fine puggy drift 10 feet thick, over 4 feet of wash of decomposed granite, which, in its turn, reposed on the granite bedrock. Although this is the direction of the

Tertiary Wyniford River, there is reason to believe that the superficial clay is of more recent date.

10. *Amber Creek.*—Mr. Tompsett has found several buttons in alluvial tin-drift in the basin of Amber Creek, near Gladstone. This drift has been deposited since the streams of the district have begun to flow in their present channels.

11. *Wyniford River.*—Mr. C. E. Ryan informed me of another button which was found in some shallow alluvial tin workings on the Wyniford River, about a mile above the Pioneer Mine. The descending section of the workings shows 1 foot of soil, covering 3 feet of sandy clay, which rests upon 2 feet of tin-bearing wash lying on granite. The button was in the stratum of clay at 18 inches from the surface. The age of the clay may be accepted as Quaternary.

12. *Moorina.*—Last year Mr. J. A. Thomson, of Moorina, showed me a button which he had found a few weeks previously in surface tin-workings in a blind creek at Moorina, 60 or 70 feet above the Ringarooma River. Soft creek gravel prevailed for 2½ feet from the surface; below this was a layer of hard cemented gravel, 2 feet thick, and in the middle of the latter the obsidianite was found. Age, Quaternary.

13 and 14. *Camden Plain and Lisle.*—Several specimens were found by Mr. T. Bessell in the well-known gold-bearing gravels at these localities.

15. *Back Creek, Lefroy.*—Mr. R. H. Wallcott reports that there is a specimen with this label in the Technological Museum, Melbourne. I have ascertained that this was found by Mr. J. Birkett, in 1881, with two other specimens at the White Lead, Back Creek, in alluvial gold-wash, 12 feet from the surface, all in a space of 6 feet square. One, a dumb-bell form, was taken to Melbourne by Mr. Birkett, and given by him to Mr. Rule, the then Curator of the Technological Museum.

16. *Thomas' Plains (Weldborough).*—Some are known from this locality, but I have no particulars of the individual occurrences.

17. *Norfolk Range.*—Several have been found in the stanniferous drift derived from this range. Mr. Geo. A. Waller obtained specimens which had been collected about 7 miles north of Pieman Heads.

18. *Schouten Main.*—Mr. Bingham found specimens in recent tin-wash at Schouten Main, 3 or 4 feet from the surface, in the flat ground below Gill's Mine.

19. *Tallywong Creek, near Weldborough.*—Mr. Rundle found one at the head of Tallywong Creek, on the tableland between Main Creek and the Weld River, in the tailrace, when working shallow stanniferous alluvial some 4 or 5 feet thick.

20. *Hunt P.A. Mine.*—Mr. Simmonds found a button in the sluice-box of this mine, on Derwent Creek, 2 miles south of George River, when he was manager of the property.

21. *Thureau's Deep Lead Mine.*—Mr. Baird found one at this mine, 3 miles east of the preceding. A 15-feet bed of wash was being treated, but it is not known whether the specimen came from the top or bottom of the deposit.

22. *Smith's Creek, Long Plain.*—The specimen found here is of a bolt-like form,* and was obtained in alluvial quartz-drift, 10 feet from the surface, when sluicing for gold in 1891.

Of course, the argument founded on the absence of specimens from the Tertiary drifts is a negative one. The evenness of size in the constituents of these leads indicates much rolling, and it may be urged that the brittle glass would succumb to the forces of attrition, and only ill-recognisable fragments of it survive. On the other hand, the discovery of well-preserved, unrolled, and sometimes remarkably shining and fresh-looking specimens in surface soil and shallow modern gravel is a strong indication of an age subsequent to that of the Tertiary sediments.

None of the discoveries in Western Australia, South Australia, New South Wales, or Queensland have been made in undoubted Tertiary deposits. The specimens have been found on the surface of the ground, in clay deposits, in travertine, in auriferous drift, in desert sandhills, but so far no positive proof of their existence in Tertiary leads has been forthcoming. It would appear, as suggested to me by Mr. W. F. Petterd, that, whatever their source, they fell at one time in an extensive shower, which embraced within its range the whole of Australia and Tasmania.

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* Figures 7, 8, 9 in Pro. Roy Soc. Tas. 1897, "On the occurrence of Obsidian Buttons in Tasmania," Petterd and Twelvetrees.

In order to procure a thoroughly authoritative and complete analysis of the glass composing these buttons, I applied to the Director of the Geological Survey of the United States (Mr. C. D. Walcott), who permitted the work to be carried out in the Survey laboratory. Two obsidianites, one from the Upper Weld, the other from the Pieman, were sent, and have been analysed by Dr. Hillebrand, the distinguished chemist of the Survey, whose results are as follow:—

	Upper Weld.	Pieman.
SiO_2	69·80	73·59
TiO_2	0·80	0·70
ZrO_2	?	0·01
Al_2O_3	15·02	12·35
Fe_2O_3	0·40	0·38
FeO	4·65	3·79
NiO	?	none
MnO	0·18	0·15
CaO	3·20	3·76
SrO	none	faint trace
BaO	?	faint trace
MgO	2·47	1·80
K_2O	2·56	1·93
Na_2O	1·29	1·03
Li_2O	good trace	strong trace
H_2O below 105°C.	not est.	0·27
H_2O above 105°C.	not est.	0·53
P_2O_5	none	none
S	?	none
	100·37	100·29

Sp. gr. 2·454 at 18°C.　　Sp. gr. 2·428 at 22°C.

Dr. Hillebrand, in a note kindly sent with this exhaustive analysis, remarks that analysis No. 1 is in so far incomplete as the water could not be determined for lack of material, and there is probably some error in the value given for one of the larger constituents, since the summation is in excess of 100, even without the water, which in all probability is present. He adds:—"The analyses revealed compositions which, while not absolutely unique in petrographic literature, are seemingly approached but once or twice. Very unusual is the molecular preponderance of potash over soda in a rock of this character, so high in lime. According to Dr. Cross' calculations, the Weld specimen corresponds with Almerose in the new classification of Cross, Iddings, Pirsson, and Washington, which is represented on page 219 of Washington's Chemical Analyses of Igneous Rocks, by an analysis of a cordierite-audesite of Osann's from Almeria, in Spain. (Z.d.D., Geol. Ges. XL., 701, 1888.) The Pieman specimen, in Washington's book, is unnamed, but falls in rang 4, sub-rang 2 (p. 143). The physical character of the glass is in nowise different from that of the usual igneous glasses. The buttons have been of considerable interest to those geologists to whom I showed them before analysis, but while not disputing the difficulty of accounting for them, not one will for a moment admit the possibility of a cosmic origin,[*] or rather, that such bodies could assume the shape shown. The latter seems to be decidedly artificial, in accord with one of the suggestions I see mentioned in the paper of Mr. Walcott's, which you were so good as to send me."

The analyses of the two rocks to which Dr. Hillebrand refers are as follow: —

	Cordierite-audesite. Almeria.	Segregation in Granite. Silesia.
SiO_2	63·75	68·87
Al_2O_3	17·62	16·42
Fe_2O_3	3·00	1·91
FeO	3·26	2·06
MgO	3·41	2·54
CaO	2·50	4·64
Na_2O	1·75	1·25
K_2O	2·40	1·10
H_2O+	2·77	1·12
	100·45	99·91

The relations of these analyses are perhaps best brought out by reducing the percentages to molecular ratios, as under: —

	Weld.	Pieman.	Audesite.	Granite segr.
SiO_2 ...	1·163	1·226	1·063	1·148
Al_2O_3 ...	0·147	0·121	0·172	0·161
Fe_2O_3 ...	0·002	0·003	0·019	0·012
FeO ...	0·065	0·052	0·045	0·029
MgO ...	0·061	0·045	0·085	0·064
CaO ...	0·057	0·067	0·045	0·083
Na_2O ...	0·020	0·016	0·030	0·020
K_2O ...	0·027	0·021	0·025	0·012

The mean of 18 reliable analyses of obsidian selected by Dr. Washington gives a SiO_2 percentage of 73·85

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[*] Dr. F E. Suess in his treatise on Moldavites maintains a cosmic origin for these natural glasses, which he calls Tektites, dividing the Group into (1) Moldavites, (2) Billitonites, (3) Australites. Australites = obsidianites of Mr. R. H. Walcott, Melbourne.

(= mol. ratio 1·231). The obsidianites vary somewhat in their silica contents, from acid to neutral, but it is easy to see that they are not composed of a glass sufficiently basic to have been derived from our basaltic centres of eruption: and as volcanoes which have emitted acid or sub-acid glass are unknown in Tasmania, the origin of the obsidianites must be sought elsewhere. Dr. Hillebrand's remarks upon their shape being due to artificial causes show how difficult it is for geologists at a distance to appreciate the mode of occurrence. Discussion of the question of origin, however, does not fall within the scope of this paper, which aims merely to place on record facts relating to distribution and constitution.

JOHN VAIL,
GOVERNMENT PRINTER, TASMANIA.

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